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CALIFORNIA FISH AND GAME

" CONSERVATION OF WILD LIFE THROUGH EDUCATION."

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CONTENTS.

	Page
PARASITES AND PARASITIC DISEASE IN THE CALIFORNIA VALLEY QUAIL ----- <i>E. C. O'Roke</i>	193
SARDINE SEASONS AT MONTEREY AND LOS ANGELES HARBOR ----- <i>W. L. Scofield</i>	198
MUSSEL POISONING IN CALIFORNIA ----- <i>K. F. Meyer</i>	201
OYSTERS IN CALIFORNIA ----- <i>N. B. Scofield</i>	203
THE CALIFORNIA BADGER ----- <i>Walter Fry</i>	204
FISH SCREENS IN CALIFORNIA IRRIGATION DITCHES ----- <i>John Spencer</i>	208
EDITORIALS -----	211
DIVISION ACTIVITIES -----	233
COMMERCIAL FISHERY NOTES -----	249
CONSERVATION IN OTHER STATES -----	254
REPORTS—	
Violations of Fish and Game Laws -----	257
Statement of Income and Expenditures -----	258
Fishery Products, January to March, 1928 -----	260
Map of Pheasant Plantings -----	264

PARASITES AND PARASITIC DISEASE IN THE CALIFORNIA VALLEY QUAIL*

By E. C. O'ROKE

From time to time reports are current that valley quail are not now as numerous in some sections as they have been in comparatively recent years. Whether these reports are true and to what factors the changing conditions may be attributed is beyond the scope of this article.

* The above article is a progress report of the investigation of parasites of valley quail which is being conducted in connection with a survey of diseases of game in California.

The study of game diseases has been made possible largely through the cooperation of the University of California. Dr. K. F. Meyer, Director of Hooper Foundation for Medical Research has accepted an appointment as Consulting Pathologist of this division, and has undertaken the supervision of our pathological investigations to

The Division of Fish and Game is, however, genuinely interested in getting at the facts. Accordingly, with the opening of the quail season in 1927 some preliminary investigations were started in order to discover whether parasitism might be a factor in reducing the number of quail.

Working under plans outlined by the Bureau of Research, the writer was detailed to carry on these investigations. The method used was to go into the field with scientific equipment, make examinations of recently killed birds and collect such material as would be useful for later laboratory studies.

The birds in general seemed to be free from external parasites. No coccidia or other dangerous protozoan parasites were found in the visceral organs. Small caecal worms such as are commonly found in gallinaceous birds were absent. This was also true of the larger round worms belonging to the family Ascaridae. In only one lot of quail taken in Stanislaus County were tapeworms present. The infestation was only nominal. It thus appeared that from the standpoint of parasites of the digestive tract, quail taken at this time of year were in a healthy condition.

Part of the routine examination was to make blood slides in the field. These were then stained and studied. Two cases of parasitism by microfilaria in the blood were found in quail taken in Napa County.

Early in the course of the investigations, the discovery of deposits of pigment in the red blood cells indicated that blood parasites of some kind were present. This condition was first observed in wild quail shot near the game farm at Yountville. The natural inference from this situation was that perhaps birds other than quail at the game farm would be found to be so parasitized.

In the course of following up this lead, representative numbers of domestic chickens, pheasants and quail were examined at the game farm. Blood samples were taken from the wing veins of the birds and prepared immediately in the field. This led to the positive identification of a protozoan parasite of the genus *Haemoproteus* in the red blood corpuscles of the valley quail. Studies were then extended beyond the open season to include several species of native wild birds as well as quail in localities far removed from the game farm. In all cases the results were the same; namely, the parasite was found only in the valley quail. Only a limited territory has been studied thus far, parasitized quail having been found in Napa, Contra Costa, Santa Clara and Stanislaus counties.

While there seems to be little in the literature concerning the serious effects of parasitism by *Haemoproteus* in birds, its similarity in appearance and behavior to the organism that causes malaria suggested that the investigations should be continued to determine whether or not this parasite is harmful to its host.

which he has devoted much of his time without compensation. The parasitological studies outlined by Mr. O'Roke are conducted in the laboratory of the Zoology Department of the University of California under the direction of Professor C. A. Kofoid.

The sportsmen of the state, as well as the Division of Fish and Game are to be congratulated for the splendid cooperation of the University of California in the study of game diseases. The knowledge of diseases of birds and mammals is now meager, especially with reference to the relation of such diseases to the abundance of game. The survey of game diseases is a progressive step that will produce much valuable scientific information in the interest of game conservation.—EDITOR.

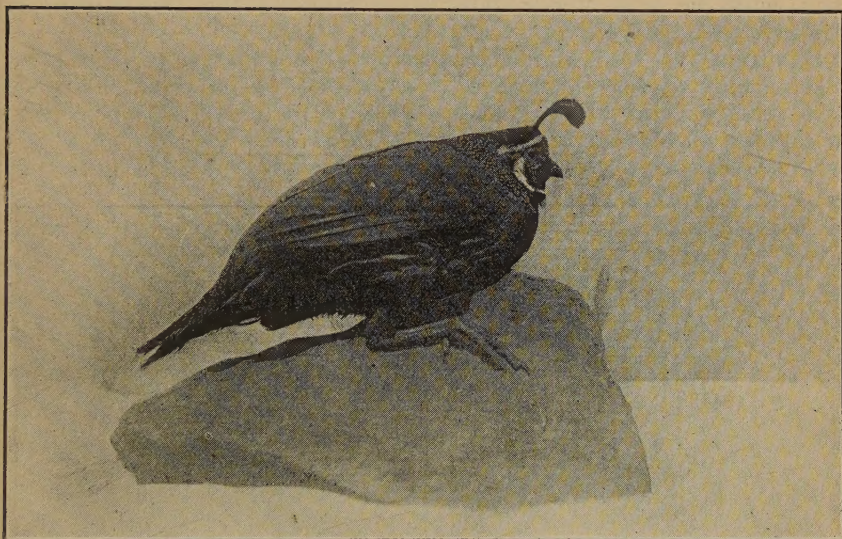


FIG. 54. Quail No. 46 in late stage of disease produced by *Haemoproteus* parasites. This bird died six hours after the above photograph was taken. Photographed June 9, 1928, by Joseph Dixon.



FIG. 55. Quail No. 32, slightly parasitized but apparently in good condition. Photograph June 9, 1928 by Joseph Dixon.

Accordingly, penned birds from the game farm and wild ones trapped near there were taken to the University of California at Berkeley where they could be kept under daily observation at the Department of Zoology.

By means of a blood counting apparatus it has been possible to make exact counts of the percentage of parasitized blood cells. This has been found to run from less than one per cent to over seven per cent in samples of blood taken from the wing veins. The birds that are most heavily parasitized are found to be anemic compared to normal

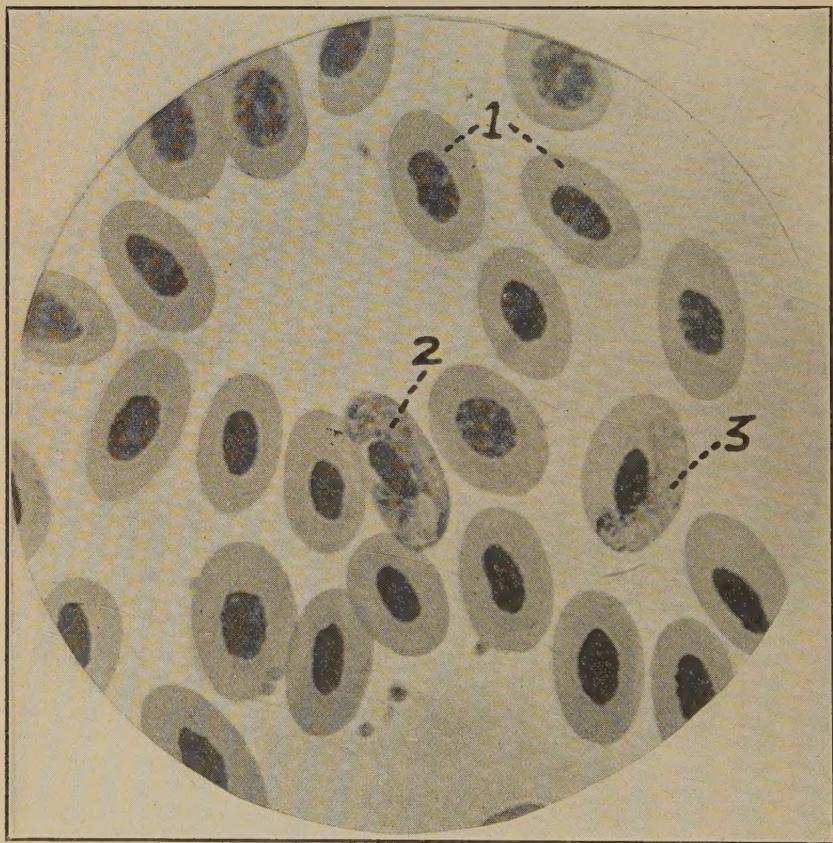


FIG. 56. Blood taken from Quail No. 39. 1, normal red blood cells; 2, *Haemoproteus* parasite, male gametocyte in red cell; 3, *Haemoproteus* parasite, female gametocyte in red cell. Giemsa stain, preparation and photo-micrograph by K. F. Meyer, June 23, 1928.

birds. It is to be noted also that they seem to be weaker and not as active as normal birds.

Our investigations are as yet too limited to enable us to predict the probable incidence of infection that prevails among the wild quail throughout the state. It probably varies with the time of year and is affected by various modifying factors. Five out of six quail obtained at the game farm April 3 were infected. Since these birds were caught in hand nets and since the weaker birds would naturally be less able

to resist capture, it is possible that the indicated incidence of infection may be altogether too high.

Of the quail kept in an outdoor pen under healthful conditions at the university three out of ten have died. Post-mortem examinations have disclosed no striking lesions other than those occasioned by the parasites that could have accounted for the death of the birds. These lesions are an enlarged black spleen, pigmented liver, and a pronounced anemia. One of the cases, that of a specimen (No. 46) taken in Santa Clara County, is of especial interest. On June 8, 1928, in the San

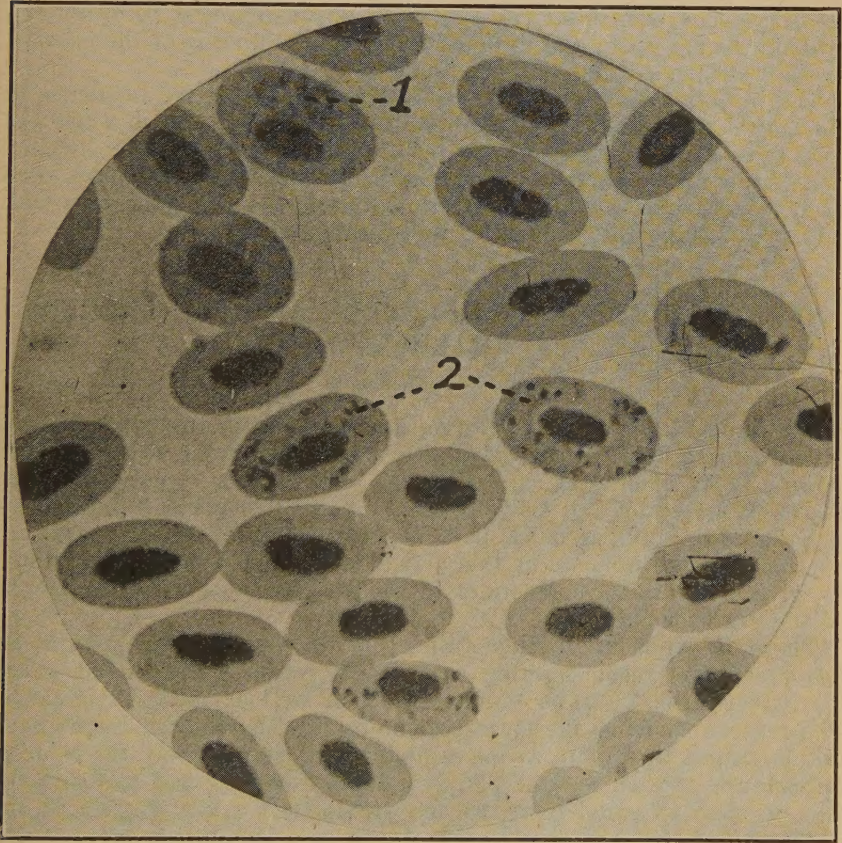


FIG. 57. Blood from Quail No. 39. 1, young gametocyte with small amount of pigment; 2, mature gametocytes, pigment granules large and numerous. Giemsa stain, preparation and photo-micrograph by K. F. Meyer, June 23, 1928.

Felipe Valley, an adult male was found that could fly but little and was unable to keep up with the covey. It soon crawled under some bushes where it was easily captured with the hands. This bird was in poor condition and its crop was empty. Upon being taken to the laboratory, it was found to be heavily parasitized. It gradually became weaker and died the following day. Failure to find evidences of accident or of disease other than that caused by the parasites leads us to believe that we have discovered a fatal case of natural infection with *Haemoproteus* in the valley quail.

In Europe and Africa where *Haemoproteus columbae* of the domestic pigeon has been studied, it has been found that the parasite is transmitted by a biting bird-fly belonging to the family *Hippoboscidae*. This is the same family to which the sheep tick belongs, but unlike the sheep tick the bird-flies have functional wings.

The writer has examined the collections of *Hippoboscid* flies of Professor G. F. Ferris of Stanford University who reports that two species of these flies have been found on the valley quail in California. It is not unlikely therefore that one or both of these flies will be found to transmit this quail parasite in California. While many species of *Haemoproteus* have been reported from large numbers of species of birds in the old world and in South America, the finding of the parasite in the California valley quail is a new record.

The investigations will be continued to determine the incidence of *Haemoproteus* parasitism in the quail of California. Much work will need to be done in order to learn the seasonal and geographic distribution of the parasite and to determine the seriousness of injuries caused by it. Experimental and observational work is now under way with a view to solving the problem of its transmission.

SARDINE SEASONS AT MONTEREY AND LOS ANGELES HARBOR*

By W. L. SCOFIELD

Within the last year the question has arisen as to just what months constitute the bulk of the sardine canning season at the two chief fishing ports, Monterey and Los Angeles harbor (including San Pedro, Wilmington and Long Beach). These two ports, separated by less than five hundred miles, have decidedly different sardine canning seasons, and the purpose of this article is to show wherein they differ by giving the relative amounts of sardine landings for each month of the year for each port.

There is great fluctuation from year to year in the amount of fish received at each canning center. Of recent years the pack has been several times greater than the pack in 1921 or 1922, for instance. The seasons showing the largest amounts of fish received might have undue weight in a plain average intended to show merely the relative importance of each month. To avoid this difficulty and to bring the two ports to an equal basis, we may treat each calendar year as one hundred per cent and figure each month as a percentage of the year. This enables us to see the true relative importance of each month as compared with the other eleven months of the year, and allows us to contrast months at the two fishing ports.

Since there is such variation from year to year, it gives a more reliable result if we use a ten-year period. In the accompanying graph and table the yearly sardine catch at each port was taken as one hundred per cent, and the catch of each month was figured as a percentage of the annual. The ten-year period, 1918 to 1927, inclusive, was used and the ten results for each month were averaged.† These catch

* Contribution No. 71 from the California State Fisheries Laboratory, May 10, 1928.

† For the benefit of the reader of sensitive mathematical conscience, we should explain that the doubtful method of averaging percentages is in this case justified since it expresses exactly the point desired.

figures are those compiled by the Commercial Fisheries Department since 1916, to show the monthly landings of each species of fish in each district of the state. (For an analysis of the sardine seasons published in 1926, see Fish Bulletin No. 11, "The California Sardine," especially pages 24 and 28.)

It will be seen (Fig. 58) that the average season at Monterey is from June through March of the following calendar year with April and May the off months. At Los Angeles harbor the average season is from October through June with July, August and September as the

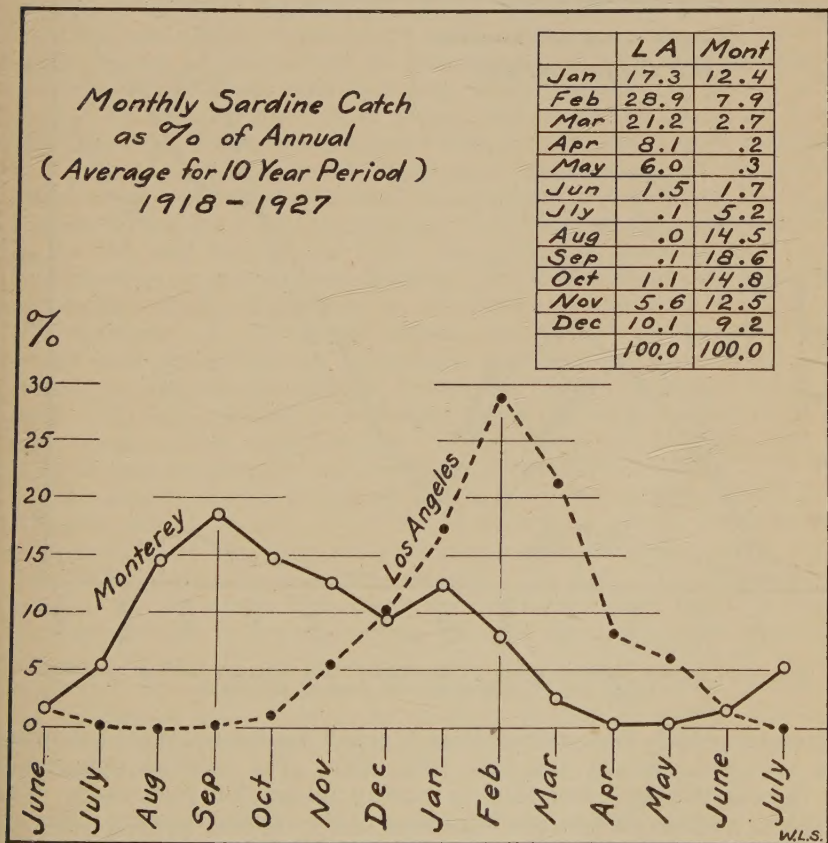


FIG. 58. Monthly sardine catches expressed as a percentage of the annual catch at each port. Percentages averaged for the ten-year period, 1918-1927.

off months. It is also evident that the Los Angeles season is more concentrated about February as the peak, while the Monterey season is distributed between six big months with September as the peak. It is characteristic of the Monterey season that January is greater than December.

The May pack of sardines at Los Angeles harbor for 1927 was considered exceptional, but in past years May was an important month in tonnage received. In 1917 and 1919, May was the biggest month of the year, and in 1918 it was second only to April. During the twelve-

year period, 1916 to 1927, the May catch has averaged considerably greater than October and not far behind April and November.

It will be seen from the graph and table that an arbitrary seven months' period at each fishing port would include nine-tenths of the catch. At Monterey, the seven months of August to February, inclusive, will account for ninety per cent of the annual catch. At Los Angeles the seven months' period, October to April, includes ninety-two per cent of the yearly total.

As an illustration of the fact that the total annual catch of sardines

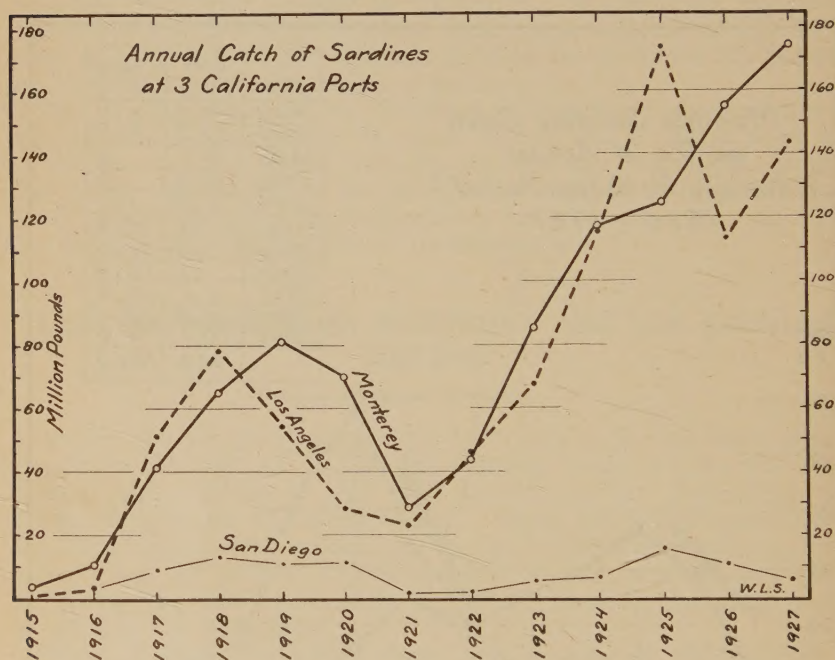


FIG. 59. Annual sardine catch at Monterey, Los Angeles Harbor and San Diego for the thirteen-year period, 1915-1927.

fluctuates greatly from year to year, a graph has been prepared showing the yearly catches by districts (Fig. 59). The relative importance of the two fishing ports may be readily traced for past years. The graph as a whole pictures the beginning of the sardine canning industry, its development during the world war with the post war slump in 1921 and 1922, followed by a remarkably quick recovery. The catch for each of the last four years has greatly exceeded the peak of the war time catches of 1918 and 1919. The trend of these catch curves is so obviously affected by economic conditions in the industry that it is hoped no one will be guilty of assuming that these curves picture the abundance of sardines in the ocean. Any banker can tell us why the pack was low in 1921.

MUSSEL POISONING IN CALIFORNIA*

By K. F. MEYER

During the month of July, 1927, 102 people were seriously poisoned and 6 died following the consumption of the large mussel *Mytilus californianus* Conrad, which had been freshly gathered at 14 different beds on the open shore line of the Pacific coast in the vicinity of San Francisco (see text, figure 1). Although the origin of the poison is not definitely established since the investigations are still in progress it is known that (1) the toxic properties of the mollusks are due to a poison, probably a quaternary amine, which is heat stabile in acid solutions and which causes motor nerve paralyses. The concentration of the poison as determined by laboratory test may vary in different mussels and different beds (see text figure 1); (2) the poison is not formed by bacteria nor due to copper salts from the rocks nor due to the little crab, *Pinnotheres pisum* which lives in the mantle cavity nor is it induced by parasites such as sponges and starfish. (3) The poisonous mussels were neither located in stagnant and polluted basins nor exposed to the sun for a long period at low tide, but they were subjected to the ebb and flow of the tides; the poison is therefore not due to asphyxiation or post-mortem changes. (4) It is probably the result of a metabolism disease influenced by the food and spawning condition of the shellfish. (5) Poisonous mussels can not be distinguished from sound mollusks neither by appearance nor behavior on cooking; occasionally a pungent odor may be noted; the "liver" is always large and dark. (6) The shellfish may become poisonous within a few days and may remain so for several weeks. No assurance can be given that the mussels may not acquire the poisonous properties overnight. (7) During the winter months December-March the poison disappeared only to reappear late in March; however, the amount of poison which may be present early in spring is not sufficiently concentrated to cause symptoms on ingestion in an empty stomach. (8) Since it is impossible to examine all the mussel beds along the California shore line it is impossible to establish by laboratory test the absence of poisonous mussels in certain beds and during certain months of the year. From the experiences thus far collected it is quite apparent that the use of mussels on the California coast during the summer months is always connected with some danger. Near Santa Cruz poisoning cases have occurred in two successive years. No assurance can be given that this condition may not repeat itself. People who notice a tingling or numbness around the lips and prickly feeling in the finger tips and toes 30 minutes or longer after they have eaten mussels should empty the stomach by an emetic, purge the intestinal tube by brisk laxatives and call for a physician immediately. All, even mild cases of mussel poisoning should be promptly reported to the State Department of Health (San Francisco, Park 8700).

* Contribution from the George Williams Hooper Foundation for Medical Research, University of California Medical School, San Francisco.

OYSTERS IN CALIFORNIA

By N. B. SCOFIELD

The native oyster of California is quite small, compared with the oyster of the eastern United States, and has never been important commercially. This native species is found on our Pacific coast from Mexico to Alaska and is fairly abundant in protected waters where there are rocky reefs suitable for them to attach themselves. In the Puget Sound region this native oyster is "farmed" along scientific lines and is the basis of a profitable industry. In California, however, this oyster has not been "farmed" and only half-hearted efforts have been made to increase the yield by putting out collectors to which the young oysters can attach themselves. The demand for oysters has grown so that this small native oyster, which is used in cocktails and dressing for meats, is more valuable than it was and it is to be expected it will receive the attention it deserves and be made the source of a profitable industry in this state also.

Oysters native to the eastern United States were first introduced into California in the early seventies, when plants were made in numerous places in San Francisco Bay. Since that time other plants have been made in Humboldt, Tomales and San Diego bays and in Elkhorn Slough. Only in San Francisco and Tomales bays have the planting operations paid. Seed oysters, or "spat," about one year of age were brought to the coast by the carload and laid out on prepared beds. These seed oysters grew with fair rapidity and reached marketable size in from two to four years, according to the size demanded by the markets. The United States Commissioner of Fisheries reported, in his 1900 report, that the value of mature oysters sold at that time was considerably over \$500,000 a year and that the quantity and value were on the increase. By 1910 the value of the oysters sold was nearly \$1,000,000 a year. One company, the largest, was doing a yearly business of \$800,000.

It was the belief of the oyster companies that the water of the California bays was too cold to permit the eastern oyster to propagate. Experts from the Bureau of Fisheries, however, found that there was some natural propagation in favored localities, especially in South San Francisco Bay. The young oyster larvae would drift to the eastward with the surface current caused by the prevailing winds, and settle down and attach themselves to the native oyster shells found on reefs along the east side of San Francisco Bay. Nothing much has ever been done in California in the way of putting out "collectors" to which the young oysters could attach themselves, the oyster companies being content to spread the spat on beds prepared with old shell, and to protect these from sting-rays with stake fences. This method worked all right until a little over ten years ago, when it was found that the young oysters did not grow as they formerly did, and that they became thin and watery, and many of them died. It then became the practice to ship from the eastern coast oysters which were ready for the market. These were then placed on the beds simply to hold them a few weeks and take them up as the trade demanded. The oyster business of San Francisco Bay has dwindled from one of the major fishing industries of the state to almost nothing.

No accurate records have been kept of temperatures, salinities or amount of food carried by the water on which oysters feed, to enable us to say just what caused this failure of the oysters. It is believed, however, that the reclamation of tide lands around the bay, which prevented the ebb and flow of the tide on the flats, has diminished the oyster food in the bay. The heavy drain on the water resources of the bay region for purposes of irrigation has largely prevented the flow of fresh water into South San Francisco Bay. It is believed that all of these conditions together have caused the failure of the oysters in South San Francisco Bay.

Soon after oysters were first planted in San Francisco Bay, it was found they did not do well in the upper bay for the reason that during the winter months the upper bay at times becomes entirely fresh water. In the summer months there are times when the bay is almost pure sea water. The eastern oyster will not stand these great fluctuations in salinity.

It is possible that, with the application of scientific methods, oysters may be propagated and made to pay where the right water conditions can be obtained. It will be hard, however, to find localities of this sort. The eastern oyster has also been tried in Puget Sound but it has been found that there, as in California, the temperature of the water is too cold to permit spawning. The eggs and larvae of the eastern oyster can live only within a narrow range of temperature, and the temperature in the sound is seldom, if ever, suitable. A species of Japanese oyster, which breeds at a lower temperature, we understand, has been successfully introduced into Puget Sound. Such an oyster might very well be established in favorable places in this state.

The best accounts of the early oyster industry in California can be found in the Reports of the U. S. Commissioner of Fisheries for 1889-91, 1893 and 1900, which can be obtained at public libraries.

THE CALIFORNIA BADGER*

By WALTER FRY

The California badger (*Taxida taxus neglecta*) is a vanishing species. The animals are yielding rapidly before cultivation, settlement and wanton killing so that in much of the territory formerly occupied, they are seen no more. Man is practically the only enemy of the badger and unfortunately kills this useful animal at every opportunity and almost always without any good reason. Some fifty years ago they were fairly abundant throughout their range, but the ever-increasing occupation by man of their territory and his hostile attitude has reduced them from year to year, and, if continued unchecked, must lead to the extermination of an animal at once picturesque and useful.

Family and Distribution—The badger belongs to the weasel family and is the third largest of that family in North America; only being exceeded in size by the wolverine and the otter. The badger's former home was in the Great Plains of North America, the Rocky Mountains and westward to the Pacific coast, from the southern tablelands and Puebla Mexico on the south, to Peace River in Canada on the north.

* Originally issued as Bulletin No 22, Sequoia National Park Natural History Series.

The animals have been much depleted or exterminated over most of their eastern range, but in the west they are still holding forth. In California the animals inhabit sparingly the more favored spots from sea level to elevations of 10,500 feet. They seem more abundant in the High Sierra where they live in the more open country and meadowlands. They have been driven to high altitudes by persecution and remain there because of the wildness of the country. Generally speaking, badgers are plains animals and do not favor heavy forest belts.

Description—The badger is an animal of strange form and habits. It is short and flat bodied, very low in stature with a broad flat-shaped head which joins directly onto the body with no defined neck. The jaws are strong and pointed and set with heavy teeth. The legs are short and heavy with unusually large feet armored with long, heavy claws. The nose is well pointed; tail short and drooping; eyes small, dark, glittering; ears small, rounded, set well down upon the sides of the head back of and slightly below the level of the eyes. The body length is about 24 inches, height about 12 inches, weight about 17 pounds. The fur is unique and beautiful, being mixed with black, white, yellow and gray. The body is a grizzled gray slightly tinged with yellowish brown with a narrow white stripe extending from the nose over top of head to shoulders. Sides of head white with black spot on each cheek. Upper part of the head each side of the white stripes, nose and feet black.

The animals have a surly, sullen and savage disposition towards other than their own kin. I do not mean from this that the badgers go about molesting or attacking other animals, for this they never do. But they do not respond to kind treatment and seldom become good pets. They always avoid trouble like all the weasel family, but when once attacked, they fight viciously and effectively. When attacked, they neither quail nor hesitate, but throw every ounce of energy into the battle; while agile as cats, they hang on in bulldog fashion. What the badger wants is to be let strictly alone so as to obey his natural impulse in his search for food. Every muscle of the badger shows tremendous strength. This, together with the dark glittering eyes gives the animal an expression of both intelligence and power. In my opinion for fighting qualities, measured by size, the badger is only outclassed by the wolverine. The dog that inadvertently attacks a badger is sure to be severely cut and slashed by the animal's sharp teeth before he can escape. Badgers are shy, sensitive and capricious animals.

Habits—Badgers are not prolific breeders. The young range from one to four in number and it is doubtful if more than a single litter is produced each year. The little badgers are born in underground burrows and in beds without nest linings. When first born they are shaped like adults, but are much lighter and of undefined color. Their eyes are closed, no teeth are visible, soles of feet are black and toes have tiny white claws. They grow rapidly and usually make a first appearance above ground at the age of about three weeks. When less than half grown the mother weans her young, but continues to catch food for them until they are almost two-thirds grown; then she leaves them to shift for themselves.

The breeding season of the badger is irregular owing to varying altitudes and climatic conditions. For instance, in the San Joaquin

Valley at elevation of 500 feet, young are born in February and March, while at Twin Lakes in Sequoia National Park at elevation of 10,500 feet, young are born in April and May. These same conditions regulate to an extent the time and duration of the badgers' hibernating period.

I have been fortunate in several personal experiences with badgers. One evening, on June 22, 1912, I came upon a mother badger and her two young in Willow Meadow, Sequoia National Park, elevation 7500 feet, where they lived in seclusion and thrived on small rodents which the mother caught in the meadow. The young were about the size of a full grown Fisher ground squirrel and to all appearances about three weeks old. When first I saw them, they were off a few feet from their burrow, the mother lying on the ground with her young rolling over in play in front of her. They did not see me, so I crawled up on their leeward side behind some willow bushes that shielded me, and was within about thirty feet of them. In a few moments, the two young badgers returned to their home underground and the mother strolled from my sight across the meadow for her evening hunt. I decided that the entertainment was all over and was moving on, when to my surprise and gratification, both the baby badgers toddled from the burrow and resumed their play. I watched their frolic for a few moments, then ran quickly to the burrow, jumped on it with both feet and sat down flat over the entrance before the young badgers realized what was happening.

Never have I seen young wild animals more mystified than were these baby badgers by my presence. Instead of dashing away in any direction that was open, as do most young wild animals under similar circumstances, they first fell flat upon the ground for a few seconds, then came direct to me, calmly looking at me, wonderingly and inquiringly, but with practically no signs of fear; then straightway, true to their kind, they began to dig under me in an effort to regain entrance to their subterranean home.

I took the little fellows in my hands and tossed them out into the grass a few feet from me, but on each occasion they would manifest an impracticable obstinacy and quickly return, uttering soft wheezy grunting sounds and making frantic efforts to reenter their burrow. They were not strong enough to do me any damage, but they gave a marvelous display, showing excellent skill with their claws in both scratching and digging. In every attitude demonstrated, an animal of persistent thought and determined effort.

Having amused myself with the animals for some little time, the young badgers were permitted to return to their burrow and I took my departure. When away a distance of some hundred yards, I saw the mother badger coming in from her evening hunt with some kind of rodent in her mouth. She soon passed from my sight into her terrestrial home to rejoin her much disturbed, but anxiously awaiting, offspring.

Badgers have but few social ties aside from those of the mother and her young during the mating period. I have never yet observed any instance of the male badgers helping to care for the young or taking any interest whatsoever in household affairs. However, in a few instances, I have seen both a male and female living in the same burrow.

Badgers feed on ground rodents of every description and on a great variety of insects. They are not gifted with either speed or stealth to

aid them in obtaining food supply and are forced to dig and capture practically all their prey underground. Their principal diet is gophers, ground squirrels, rats and mice. They are skillful in locating the burrows of their quarry and the inhabitants soon fall victim, owing to their rapid digging. Indeed, they are so destructive to rodents that prey on vegetation that their services are more beneficial to agriculture than those of any other of our North American mammals.

Badgers are largely nocturnal in habit and hunt chiefly at night, but when forced by hunger they will hunt by day. They wander far and wide in search of food at night, but usually return to their burrows by sunrise. They move around little, except in search of food. When it becomes scarce they shift to a new territory where food is more plentiful. They establish themselves in their new home by digging a new burrow in which to live and to be sheltered from enemies.

Of all our North American mammals, badgers hold the record for rapid digging. On September 2, 1912, while at Mitchell Meadow, Sequoia National Park, elevation 8500 feet, we came suddenly upon a large badger some 100 yards from his den. We shut off his return to his burrow and chased him for a few moments on horseback. No sooner did we stop our chase than the badger dug into the ground and made the most rapid progress in digging of any animal I have ever seen. Although the ground was hard and somewhat crusted with sod, the badger dug himself completely from our sight and plugged the hole behind him with dirt in less than one and one-half minutes. In excavating, his whole being was brought into action; he used all four of his feet as well as his mouth with great skill.

Should the Badger Be Protected or Exterminated?—The worst enemy the badger has is man. I have never found evidence that badgers have lost their lives through any other enemy except large domestic dogs. Large birds of prey and carnivorous wild animals seem to leave the badgers strictly alone. I do not know whether this is due to the savage fighting qualities of the badger, or whether the flesh of the badger is distasteful as food, or both; but believe it is due to the former cause, for the badger's thick fur and tough skin are hard to penetrate and when the animals once engage in combat they will fight to the death.

To me, the California badger is one of our most interesting and beneficial animals. It should be given protection. At present, the only shelter the animals have is within our National Parks. Here there is perhaps sufficient seed stock left to insure perpetuation of the species within a given area for sometime to come. But when the animals pass beyond the boundaries of the parks, they soon fall victim to hunters and trappers. Furthermore, the animals have never been proven guilty of destructiveness. The worst harm which they have ever been accused of doing to man is that the burrows they dig, on occasions, have caused horses to stumble and fall with their riders. But as compensation for this, the badger hunts and kills rodents that are harmful to crops and other growing vegetation, 365 days each year of his life.

The wanton destruction of this picturesque and beneficial species of California mammal life is unwarranted and unjustifiable. It should be stopped. Let us have it said that California is the one safe spot in this vast republic that may be called the badger's last home. A spot where the animals are given the right to live out their lives according

to their destiny in peace; a right of a harmless and useful animal that man is in duty bound morally to respect.

No moral law is ever violated with impunity. Man is paying for his brutality to the badger in the plagues of rodents which God created the badger especially to prevent. Give the badger a chance and he'll clean up the ground squirrels, gophers and other rodents which destroy California's crops.

FISH SCREENS IN CALIFORNIA IRRIGATION DITCHES*

By JOHN SPENCER

The work of fish screen installation in the State of California is carried out under provisions of the Penal Code, which in general state that when, in the judgment and opinion of the Fish and Game Commission, a fish screen is required to be installed in a ditch, tailrace, tunnel,

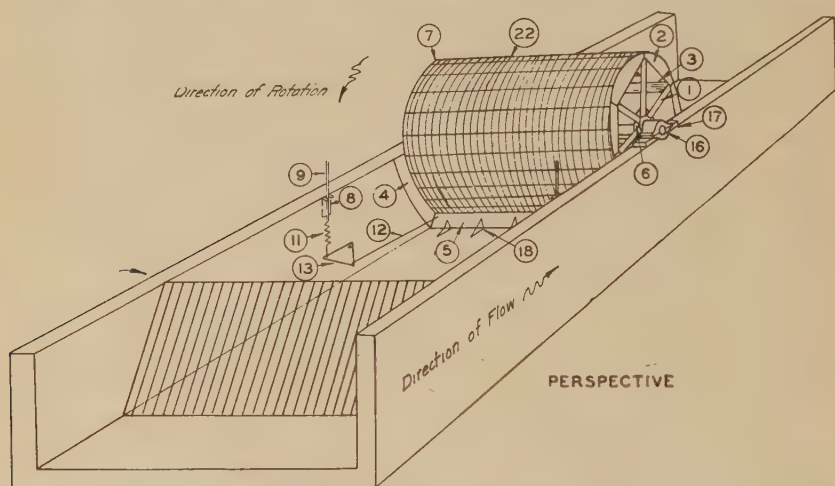


FIG. 61. Diagram of the California rotary fish screen. In front is a parallel "grizzly" or rack to protect both screen and ditch, constructed on either timber or steel and placed near head of it. No. 5 indicates draper board on strap hinges (18), and No. 9 to B shows parts of adjustable spring device to regulate the draper.

etc., the Commission may order one in, specifying location, type, size and in fact, all the details which are necessary for its construction.

The party ordered to install a screen may request a hearing on the necessity of its installation within ten days from the date of service, and failing to do so the order is fully effective. If a hearing is requested, the Commission will then issue its findings after said hearing. If the screen is not installed as requested by the Commission, the matter may be carried to the courts. If a screen is installed in accordance with the requirements of the Commission and maintained, then costs arising from changes in design by the Commission must be borne by the Commission. All costs are borne by the owner of the water, except any change of design as above noted. The law was enacted in 1895 and last amended in 1927.

* Spencer, John. 1928. Fish Screens in California Irrigation Ditches. *Pacific Fisherman*, April, 1928, p. 16, 2 figs.

Two general types of screen installation are used in California, namely, the rotary self-propelled type and the stationary parallel bar type. The rotary type consists of a steel shaft to which there is attached a circular frame which supports mesh of $\frac{1}{2}$ by six inches, with boards or paddles set on the inside which furnish the motive power for its rotation. This screen is set in a box of supports for the entire width to be screened and is a little over twice the height of the water in diameter. To pass the trash that may come down, or to remove the moss, it is set up from 4 to 8 inches from the bottom of the ditch and this space is protected by a board set on hinges, fastened to the bottom of the ditch and connected by rods to a spring, so that when the pressure of the trash becomes more than the tension of the spring, the board or draper will drop down sufficiently to pass this trash and then come back into place. On the top of this draper, or board, is a section of canvas or rubber belting which lightly touches the wheel as it rotates and thus leaves and moss are removed from the rotating screen.



Fig. 62. Battery of four rotary screens operating in a 20-foot ditch diverting water from the Arroyo Seco River, Monterey County. Photograph by John Spencer, March 22, 1928.

This general type is used because it is not patented, and while there may be patented screens that are equal to and perhaps better, yet it would not be policy to order in a patented screen unless the diverter of water so desired it.

The stationary parallel bar screens are built in sections and placed at an angle to the direction of the flow—the greater the angle the better—and trash is thus carried on up to the upper portion of the bars and thus more easily removed than if the parallel bars were set at right angles to the flow of water. Speaking roughly, these stationary parallel bar screens are a refinement of what is commonly known as a grizzly, or rack. There are variations of this type of screen in that some are made to rotate, and some have attached a self-cleaning device, the power being furnished either by the water itself or by a motor. For these bars the spacing is seldom less than $\frac{1}{2}$ inch, and when placed properly in the stream offer no appreciable interference with the flow of water.

The stationary type of screen is in general considerably cheaper to install, in proportion to the area to be screened, than the rotary type,

and is more commonly used for the larger ditches, while the rotary screen is considered more suitable for small ditches.

It is felt in California that the matter of screening is one that should be taken up between the various commissions and the diverters of water in a way that would consider the interests of both; and when this is done, it has been found that the rights of the diverter are not infringed upon nor is he unduly burdened, and the best type of installation will thus be decided upon.



CALIFORNIA FISH AND GAME

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September 15, 1928

Unstocked or depleted waters indicate a wasted resource and are a direct challenge to our ability to develop the uses of our mountains and streams.

A LOOK TO THE FUTURE

For many years past, it has been difficult to find a basis for optimism regarding the future of game in the United States. Depletion has been noted everywhere. We look for instances where actual increase has been noted and discover that these are few and far between. The average person interested would probably cite Vermont and her increase in deer and Pennsylvania with her improved conditions. There should be other states where improvement is noticeable; certainly considerable sums of money are spent annually. There are those with a vision and able to properly plan restoration programs. Why then are outstanding results so far between? Doubtless, a partial answer to this question is to be found in the fact that states have been floundering around attempting to find suitable methods of solving the many problems presented. Each state has suddenly found itself confronted with depletion and has then begun at too late a date to remedy conditions. As a consequence, considerable time has been needed. Now that certain states have demonstrated what can be done, other states will model their programs after successful states and will help to bring about the improved conditions sought. After many years of test, certain general policies have been determined upon here in California and a worthwhile program inaugurated. Given time, results are sure to appear.

SOUND VALUE

Extravagance in government has, from the beginning of time, been the popular

cry and complaint of the public who pay the bills. Certain it is that in many instances such complaints were well founded and history reveals that many thrones have tottered and empires have fallen through the revolution of a long suffering people, righteously indignant at their yoke and burden of taxation.

Modern theory of government and up-to-date business methods applied thereto have greatly lessened this evil, and yet complaints may still be heard and there is still probably here and there some room for improvement.

Whatever may be its other failings, no good reason exists why the Division of Fish and Game should be found extravagant or wasteful on any occasion. The conservation, protection and upbuilding of our resources of fish and game is a vast business enterprise of the people of California and must be carried out by efficient business methods, the cornerstone of which is economy of operation.

The same principle that governs private business must govern this Division. It must be adhered to by the department head when arranging his budget, organizing the work of his department, purchasing supplies and selecting its personnel. It must govern as well each individual of the field force in the performance of his duty. Each day's work in patrol or otherwise should be planned to save all unnecessary expense and lost motion. To successfully and most efficiently conserve the state's wild life, we must conserve the funds with which we have to work by practicing at all times true economy, not the "penny wise pound foolish" variety, but that which will return to the state sound value for every dollar expended.—Eugene D. Bennett.

IN MEMORIAM

DAVID E. ROBERTS

My intimate acquaintance, both social and official with Dr. D. E. Roberts who passed away April 13, 1928, enable me to know and analyze "Doc," perhaps more intimately than any other person. To know a man's true worth in the standard in which we should estimate him, one must enter into business relations aside from just that of friendship which is easily made.

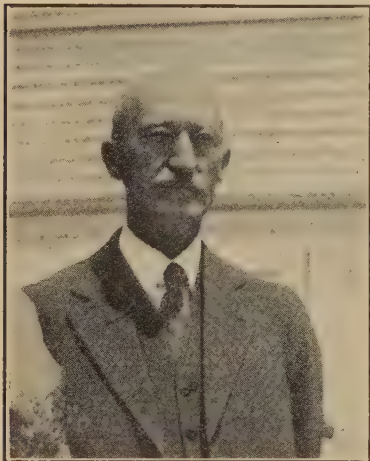
Deputy "Doc" Roberts had a host of friends among the sportsmen of the Mother Lode, San Joaquin and Sacramento counties, and wherever he was known and wherever he enforced the laws relating to the protection of our wild life.

Beside his code of game laws which he practiced and which it was his duty to enforce, "Doc" had a code of his own which was of greater value than all the statutes relating to game protection. Game law violators, and there were many in the days when he became an officer, respected him because he was the highest type of a sportsman. "Doc's" code called for and gave a square deal. He educated instead of persecuted. He exacted truth-

was a type of man and officer that should be copied by all law enforcement officers.

GEO. NEALE,

Former Executive Officer of the
Fish and Game Commission.



David E. Roberts

ful promises from violators because he knew only truth himself. He detested dishonesty because honesty was a part of his code. Hypocrisy, deceit and ingratitude were contrary to his code of ethics.

David E. Roberts was a native of Calaveras County. In his early years he practiced dentistry. He was a member of the Board of Supervisors of Calaveras County for some years. His great love for "the open" called him away from his profession. He was appointed a State Deputy of the Fish and Game Commission October 1, 1911. Even then many of the old timers were as a law unto themselves, respecting game laws with a less degree than any other of the statutes. "Doc" gave them what any old timer expected and exacted, a square deal. In a short time old Calaveras County was one of, if not the best game law abiding counties in the state. He was attached to the Sacramento Division Office under Commissioner Newbert with Geo. Neale in charge of the Northern Division. At the time of his death he was captain in charge of the Sacramento District. "Doc"

FRANK MACHADO

It is with extreme sadness and regret that we announce the death of volunteer deputy, Frank Machado, by accidental drowning, on June 10th. Deputy Machado was in his motor boat on Pinto Lake, near Watsonville, when, in attempting to fix his stalled motor he lost his balance and fell overboard. It was a very windy day, the lake was rough, and before those who witnessed the accident were able to reach and render assistance to Machado, he was drowned.

Frank Machado was a popular young man, a lover of the wild life and the great outdoors, and was an efficient, hard-working deputy.

He is survived by a wife and son, daughter, mother, brother and sister, all of whom reside at Watsonville.

The funeral, which was largely attended by relatives and friends, was held at Watsonville June 14.—Walter R. Welch.

MORE KNOWLEDGE NEEDED

Trout have been propagated and planted in streams for more than fifty years. Some improvements have been made in fish cultural operations, but many fundamental facts relative to necessary food, care and disease need to be made available to fish culturists. There has been little change in the actual methods of planting and only recently have some of the faults of present methods been exposed, as a result of controlled experiments.

Canada has been most forehanded in pointing out certain dangers. Mr. A. P. Knight has shown that from 73 to 96½ per cent of the fry dumped into the streams, lose their lives because of enemies; that native fry are better able to care for themselves than hatchery fry; that predatory fish increase as a result of the additional food fish by fish planting. Mr. Knight's last report on his experiments was published in *Rod and Gun in Canada* (volume 29, pages 783-787, 819-820). Certainly the evidence presented should force the conclusion that there is still much to be learned regarding interrelations of organisms in a stream, and at the same time, is a reminder that there has been considerable waste in the past

because of a lack of this pertinent knowledge.

This report also suggests to the reader that other controlled experiments determining whether it is a wise procedure to take fish from a stream less than six inches in length and whether artificial food supply could be furnished which would support greater numbers of fish would contribute greatly to future projects.

ADVISORY COMMITTEE APPOINTED

At the last session of the legislature the hunting and angling license law was amended to provide "that the fish and game commissioners are hereby authorized and directed to expend, for a period of five years, beginning with January 1, 1928, not less than one-third of all moneys collected annually from the sales of hunting licenses in the purchase, lease or rental, and the development, improvement, maintenance and administration of land, or land and water, or land and water rights, therefore suitable for game refuges or public shooting grounds, or both, within the State of California." It further provides for the appointment of a game refuge and public shooting grounds advisory committee to consist of seven members. Early in the year, this advisory committee was appointed and approved by the governor. It is composed of Jacob Baum, Los Angeles; H. L. Betten, Alameda; J. Dale Gentry, Santa Barbara; Manly Harris, Dr. K. F. Meyer, Nathan Moran, and Dr. Barton W. Evermann of San Francisco.

On April 8 the committee met and organized, electing Nathan Moran as chairman. This committee has undertaken the work before it with enthusiasm and progress reports may be expected from time to time. Each seems to realize the great need for something constructive along the lines of game refuges, particularly of wild fowl refuges, and consequently worthwhile results will be forthcoming. A report as to the original breeding grounds of migratory game birds, their former and present status together with the means to be taken to restore former breeding and feeding grounds was discussed at the second meeting of the committee.

SENATE PASSES FEDERAL GAME REFUGE BILL

For seven years there has been reported in these columns the ups and downs of a proposed law to create federal game refuges and public shooting grounds, and at the same time, to establish a

federal license. Each year the bill has been proposed, there have been stormy sessions of debate, ending with defeat for the proponents of the measure.

Opponents of the measures of past years have held out for an elimination of the federal license, for recognition of state rights, for direct appropriation, and for an elimination of the objectionable feature concerned with the trial before a United States Commissioner.

The Norbeck Migration Bird Bill of the present session of congress was introduced in practically the same form as those of past years. After being debated at great length, it was amended until it hardly bears the semblance of former measures. In this amended form it passed the senate on April 18, 1928. The new bill does not contain the objectionable features. This bill makes actual sanctuaries of all of the game refuges, rented or purchased; provides adequate warden protection, and authorizes appropriations not to exceed \$1,000,000 a year. Another interesting feature is the following:

"That when any state shall by suitable legislation make provision adequately to enforce the provisions of this act and all regulations promulgated thereunder, the Secretary of Agriculture may so certify, and then and thereafter said state may take over the enforcement of said act and the regulations made in aid of said act. The said state may and shall, so long as it shall enforce the said act and regulations made in pursuance thereof, be reimbursed from said funds for the costs of said enforcements to that extent said services would have cost had the service been performed by the federal government."

It was impossible to get this bill to a vote before congress adjourned. It will come up again at the next session and in the meanwhile sportsmen and other conservationists can make their wishes known to their representatives.

PACK TRAIN TO TRANSPORT GOLDEN TROUT

There has been little distribution of golden trout in the southern Sierra during the past ten years. Beginning July 1, 1928, five head of stock equipped with pack cans and three animals to carry provisions were placed in charge of Deputy F. A. Bullard. Special trips will be made to waters stocked in 1914, and from there adult fish will be transported to barren streams and lakes in adjacent territory. Later in the summer, when golden trout fingerlings become

available at the Mount Shasta Hatchery, these will be carried by pack train and planted in isolated localities.

It is becoming more and more evident that out of the way places are becoming populous centers of vacation travel and that the streams adjacent will soon be overfished. A wider distribution and the full utilization of all waters is the one preventive of present day problems. With others, we are willing to admit that unstocked or depleted waters indicate a wasted resource and are a direct challenge to our ability to develop the uses of our mountains and streams.

A FULL PROGRAM FOR SUMMER RESORTS

An intensive program of education was planned for summer resorts and camps this summer. The nature guide work at Yosemite again was a cooperative program between the Division of Fish and Game and the National Park Service. The Yosemite School of Field Natural History opened its doors for the fourth season on June 25 to give training in conservation to teachers and nature guides. The Division of Fish and Game was represented by two nature guides in California State Redwood Park who conducted field trips and gave evening lectures. This ambitious program of education for summer vacationists is based on the fact that people are most susceptible to conservation ideas when face to face with nature. The need for conservation is more apparent when a person is out-of-doors than when he is within four walls.

MORE STATE PARKS MEAN MORE GAME REFUGES

Every reader of this magazine should be interested in the state park program. At the last session of the legislature, a Division of State Parks, under the Department of Natural Resources, was created, and a bill passed providing for a referendum at the November election to provide a six-million-dollar bond issue, which, matched dollar for dollar by outside funds, will make possible the purchase of some of the more important areas needed for a unified park system. As has been evidenced in the State Redwood Park in Santa Cruz County, a state park can become a worthwhile game refuge. Visitors have long been pleased with the tameness of deer and their abundance. The Mount Tamalpais region, which is already a game refuge, will undoubtedly be one of the first areas added to the state park system. Additional areas useful as recreation grounds

will be a direct contribution to the game refuge system. Many states plan their refuge system on the basis of large areas for every county and smaller areas for every township. An additional number of state parks will furnish some of these needed smaller refuges.

CONSERVATION LESSONS AS AIDS TO CLASSROOM INSTRUCTION

The special attention given in the lecture program of the Division's Bureau of Education to elementary grades in city schools has supplied the teacher in many cases with seasonable material for classroom exercises. The conservation lessons taught with the aid of specimens have, in a number of instances, been a source of inspiration for compositions. The following from a low fifth grade in an Oakland school reveals that the pupils absorbed the lessons and reproduced a surprising amount of the material presented.

"In Italy and Spain the people had big nets. With these nets the people caught all the song birds that were going where it was warmer. When the birds rested in the hedges the people put the net right into the hedges and the birds got caught and the people ate them.

"Birds are very helpful, they eat the insects and grass seeds. When the people catch the birds and eat them the insects come and eat their crops. This makes their country poor.

"The people chop down all the timber and when it rains the water runs down the hills and washes all the soil until it comes to clay. Their crops can not grow because the clay is not fertile.

"When there are forest fires and it burns all the trees and brush, the animals will not come again because there is no food for them. And when it rains the water washes all the ashes and burnt things down into the little brooks and the fish die. Another way when there is a fire, the water in the brook will get warm from the heat and the fish die.

"When the salmon goes to spawn it goes to fresh water. After it spawns it starts to go back to salt water, but before it reaches its home, it dies.

"All trout belong to the salmon family. Fish do not have lungs. When you see them it looks like they are yawning; every time they do it, water goes in their mouths. They breathe the oxygen and the water goes out through their gills.

"The trout is a silvery fish and his tail is different than that of the salmon. The salmon's tail is skinny; the trout is wide. The men in the cannery can tell easily, because when they pick up the salmon it is easy; when they pick up the trout it slips out of their hands.

"The Roosevelt golds are only found by the high mountain, Mt. Whitney. The men from the fish hatchery go up there and get the fish eggs and bring them back and hatch them. They then put them into something like a milk can, and take a lot of burros and put them back. They stop every few hours by a stream and put the cans in the streams to keep the cans cool. When they camp over night they leave the cans in the water all night.

"There is a hatchery not far from Mount Whitney.

"The trout love fresh, bubbling water. But they can not stand salt water. The salmon lives in salt water and spawns in fresh water.

"The trout loves shady brooks.

"In a fish hatchery, they have troughs. They keep the fish eggs in troughs. When the eggs hatch, the little fish come up to the trough for something to eat. The men feed them for a few months.

"The trout and salmon have black spots.

"The rainbow trout is very pretty. It has a pink stripe going through the lower part of its body.

"A pack of Roosevelt trout went up a stream. The stream had some lava in it. The water was a different color. That is why they are this color. They

"She said some countries were poor,
Such as Italy and Spain,
For after birds were in their reach
They never flew again.

"She told us that we oughtn't
To cut our forests down;
They do it to make cities
But what's the use of another town?

"Some people are careless
When they go into the wood,
And forget to put their campfires out,
As we know they should.

"The heat of the forest fires
Kills the fishes in the streams
And burns down all the timber,
Spoiling pretty scenes.



FIG. 64. State lion hunter Jay Bruce with a take of five lions.

are a little green at the top and yellow. They have black marks in the middle like finger prints. The tail has black spots.

"There is another kind of fish which is called steelhead. When it spawns it goes upstream and when it goes back it does not die like salmon. It goes back and forth to the ocean.

"Spawning means when a fish goes to spawn it goes upstream where there is sand. It flips its tail back and forth, making a small hole in the sand, in which it lays its eggs. A fish lays from 300 to 1200 eggs."—Emile Petersen.

"Mrs. Brownlow was very nice;
She told us many things
How to put the campfires out
And about the bird that sings."

—Julia Towar

"When the trout comes up the mountain stream, it finds a place to spawn. After he finds a place to spawn he makes a little hole with his tail, there he lays his eggs. Sometimes he lays three and four hundred eggs at a time.

"After he goes back to his home in the mountain stream, men come and take the eggs to the fish hatcheries. There the eggs are put in ice cold water.

"When the fish come out of the egg, the egg stays on the fish's body, and that is what he feeds on until the egg is all eaten off, then he is old enough to eat other food.

"Mrs. Brownlow came to our class
To talk about the song bird.
She told us many, many things
We never heard before.

"The men who feed the fish chop up liver very fine. They put it in a dipper and put in the water and it makes the water look like milk. The fish feed off this until they are big enough to live in the mountain stream once more.

"The men take pack mules or horses or burros and put the fish in cans, that look like milk cans, and take them up to the highest mountain streams where the water is always rushing and foaming down the mountains.

"It takes them four or five days to go up, and about three to come down. They stop every hour and put the cans in the water, because the water in the cans gets warm and the fish do not like it. At night they leave the cans overnight, they put a screen on the can so the fish would not get out, then they let them out the

It requires no stretch of the imagination to picture what the game sanctuary or refuge means to birds or animals. For a number of years, our National Parks have been concrete examples of this system of protection and natural propagation.

Many states have adopted this plan and in nearly every case the results have more than justified the outlay of time and money. If the output of our game farms could be liberated in well protected game sanctuaries under the supervision of a competent attendant, it would be but a few years until the adjoining terri-



FIG. 65. An ideal spot for pheasants. Liberation of 100 birds, Bryden Ranch, Marysville, California.

place they want to let them out."—Raymond Greenman.

HOW BIRDS RESPOND TO PROTECTION

Birds as well as animals seem to know where they are protected and show their appreciation by making themselves at home. The dove shown in this picture is one of a half dozen that found their way into the pheasant pens on the State Game Farm and have taken the liberty of remaining and going about their business in a normal and natural way by nesting and otherwise conducting themselves as doves are wont to do.

tory would be well stocked with game birds and the sportsmen would then be getting real interest on his investment.—August Bade, Yountville, California.

ANOTHER BLUE JAY HUNT

A news item carries the information that in a certain county at least one thousand "of these pirate birds were destroyed as a result of an annual hunt." The item is dated April 25, 1928, and goes on to state "scores of hunters took part in the yearly event and scatter guns operated all day." To many it will seem a worthwhile accomplishment to destroy

a thousand blue jays; some will say that at least an equal number of quail were thus saved. We wonder how many will think of the other side of the question. If scores took part and scatter guns operated all day during the early nesting season of quail, we wonder how many deserted nests of quail remained behind. With such a picture before us, we can not help but wonder whether a blue jay hunt staged in the spring during the nesting season of quail accomplishes as much as is claimed for it. Those who have observed how easy a quail will desert a nest when disturbed will be the ones who will line up against shoots of this kind.

WARNING



HUNTERS AND FISHERMEN

Volunteer Deputies of the Division of Fish and Game are patrolling and strictly enforcing the Fish and Game laws in this district.

CALIFORNIA FISH AND GAME COMMISSION

FIG. 66. Sample poster issued by volunteer deputies.

LOOKING BACKWARD

Sometimes a review of the past stirs one to heightened endeavors, for to use an old phrase, "the success of the past is the hope of the future." A glance backward at the record in game conservation in this state shows the following:

1852. First closed season (12 counties), antelope and elk.

1854. Closed season on antelope and elk throughout the state.

1869. Lake Merritt established as game refuge.

1880. Trapping of quail, partridge or grouse prohibited.

1889. Board of fish commissioners authorized to import game birds for introduction.

1893. Hunting with gun larger than ten gauge prohibited.

1895. Possession or sale of game during closed season prohibited.

1897. Robin removed from list of game birds.

1901. Night shooting prohibited. First daily bag limits established.

1905. Sale of doves and all shore birds prohibited.

1907. System of annual hunting license inaugurated.

1909. Game refuges established. Use of animal blinds prohibited.

1913. Sale of game with exception of ducks and geese prohibited. Afterwards repealed by referendum.

1915. Wholly closed season on rail, wood duck, band-tailed pigeon, cranes, and shore birds.

1919. System of game refuges greatly extended.

1927. Definite program of game refuges assured through allocation of license fees.

These are accomplishments of the past. Accomplishments of the future should include further extension of the refuge system.

DEPUTIES FACE NEW PROBLEM

Imagine the difficulty of a game warden these days! Instead of looking after the violators residing in his own county, he must watch for the influx outside his district. A game warden in southern California, who has patrolled his district for sixteen years, states that ninety-five per cent of those who hunt in his county come from without the county. Nor do they travel with a team of horses. This makes a new situation and a growing one which will take new methods to properly control.

WILD FOWL REFUGE FUNCTIONING

The only wild fowl refuge established in recent years in this state is Richardson's Bay, in Marin County. That this refuge is attractive to birds is proved by a recent census made by Dr. Harry Oberholser of the Bureau of Biological Survey and Captain Walter Sellmer, on March 2, 1928. On that date, it was estimated that 3500 ducks were congregated on this bay.

STREAMS CLOSED TO ANGLING

Under the law providing for the closing of trout streams passed by the last legislature, a number of the heavily fished streams were closed to all angling when the trout season opened on May 1. They were closed by executive order of Governor C. C. Young, and Fred G. Stevenot, Director of Natural Resources.

Two classes of streams and tributaries were closed: first, those closed arbitrarily because of the necessity of protecting the streams for egg-taking purposes by the Division of Fish and Game; and second, streams recommended either by sports-

the streams, additional deputies will be placed on patrol duty, and the closed area will be closely guarded.

The notice below is the official closing order and the original notices signed by Governor Young and Director Stevenot.

Following the official notice will be found a list, by counties, of all streams and other fishing water closed under this order:

"For the purpose of further protecting trout with which the Fish and Game Commission has stocked the various waters of this state, of insuring their larger growth and better means of propagation as well as providing an adequate supply of trout eggs for the various fish hatcheries of



Fig. 67. Settling tank at Kings River Experimental Hatchery.
Photograph by E. G. Grimes, June, 1928.

men's organizations or by petitions filed with the Fish and Game Division by interested groups of citizens.

By closing of these heavily fished streams and lakes it is hoped that fish in the tributaries will attain larger size before going into the main rivers, and that spawning grounds will be protected and the egg take thereby greatly increased.

Signs were placed at conspicuous places where camp sites are located, where roads and trails cross the streams and all points where they can be easily seen by the fishermen. In addition to the posting of

this state to the end of improving fishing conditions generally throughout the state;

"Now therefore, upon the recommendation of the Fish and Game Commission of the State of California and pursuant to and by virtue of the authority vested in me by the provisions of Chapter 751, 1927, Statutes of California, it is ordered that the following waters within the County of _____, State of California be and the same are hereby closed to trout fishing or the taking, killing or having of any trout therein or therefrom from and after the date hereof and during all times and seasons until such time as new legislation is enacted by the state legislature or by further or other order of the Director of Natural Resources.

"It is further ordered that in addition to the publication of this order as pro-

vided for by Sec. 4 of the aforesaid statute, a copy hereof be posted at the courthouse of said county at the place where notices are posted pursuant to the provisions of Sec. 1373 of the California Code of Civil Procedure, or some other conspicuous place."

1. STREAMS CLOSED TO FISHING TO PROTECT THE SPAWN-TAKING AREAS.

Humboldt County: Prairie Creek, and all tributaries, to its junction with Redwood Creek.

Inyo County: Middle Cottonwood Lake and connecting streams.

Lassen County: Snag Lake and tributaries.

Mono County: Reverse Creek from June Lake to the point where it enters Rush Creek.

Shasta County: Grassy Lake and stream connecting with Snag Lake.

Orange County: Holy Jim Creek.

Nevada County: Alder Creek and Sage Hen Creek.

Los Angeles County: Bear Canyon Creek and Devil's Canyon Creek.

Lake County: Willow, Rice, Deer, Trout, Soda and Salmon creeks, tributary to South Eel River and Rice Fork to Eel River.

Fresno County: All tributary streams flowing into Shaver Lake. All tributaries to Dinkey Creek, including West fork of Dinkey Creek, Rock, Bear, Laurel, Deer, Bear Meadow and Ross creeks, and other unnamed creeks.

El Dorado County: Rainbow Lake, Grouse, Le Conte, Waca, Pyramid, Gefo, Toem and Jabu lakes.

Tributaries to Lake Tahoe in El Dorado County are McKinney Creek, General, Meeks, Lonely Gulch, Rubicon, Eagle, Cascade, Taylor creeks, Upper Truckee,



FIG. 68. Kings River Experimental Hatchery. Photograph by E. G. Grimes, June, 1928.

2. STREAMS CLOSED ON RECOMMENDATION OF SPORTSMEN'S ORGANIZATIONS AND INTERESTED CITIZENS.

Tulare County: McIntyre, Boulder, Bear, Coy, Lost Meadow creeks, North Fork of Middle Fork of Tule River above Redwood Crossing, Alder Creek, Deer Creek above its junction with Tyler Creek.

Sonoma County: Santa Rosa, Mark West and Salmon creeks.

Siskiyou County: Soda Creek.

Shasta County: Hazel Creek and Shotgun Creek.

Plumas County: Thompson, Tollgate, Black Hawk, Clear and Rock creeks, all tributary to Spanish Creek. Also, Red Clover Creek, tributary to Indian Creek.

Placer County: Martis Creek and tributaries to Lake Tahoe, including Griff's Creek, Slim Jim, Burton, Ward, Blackwood, Madden and McKinney creeks.

Trout Creek, Cold Creek and all tributaries of the above named creeks.

Plumas County: Butt Creek.

Tulare County: Big Kern Lake, Tobias and Brush creeks.

Santa Cruz County: All streams after August 1, each year to May 1 of the year following.

STATE PARKS AND GAME PROPAGATION

Our forefathers, in landing and settling these United States, found the Indians to be true sportsmen as they positively would only kill what game they needed for food. I am very sorry indeed, our people, who love the chase and great outdoors, have not followed the example

set by the North American Indians, who were, and what few remain today are the most sincere conservationists of this great continent.

The forests of any state are one of their most valuable assets. Without forests the human race would suffer a great loss and without forests our wild life would be destroyed almost entirely. The stately trees with the accumulated undergrowth and the mossy floors furnish very excellent protection and food to a certain extent for wild life of practically all species. Therefore it is very essential that in the establishment of state parks, the commissions, departments, or under whosever's supervision this comes, should by all means establish game refuges thereon. On said areas there positively should not be any hunting of game or insectivorous birds at any season of the year. Of course, vermin should be controlled rather than eliminated, as it is very essential in the propagation of game of any species that vermin should be controlled in a manner whereby any species of vermin should not become plentiful enough to be detrimental to the game on the area in question.

The establishment of game refuges on these areas is very essential for the assurance of the continuation of wild life on this continent, whereby future generations will have some of the enjoyment of their forefathers from the great outdoor life, and especially the chase.—E. Lee Le Compte, State Game Warden of Maryland.

BOY SCOUTS AND CONSERVATION

Considerable newspaper publicity was recently given to the successful efforts of Boy Scouts of Great Falls, Montana, on behalf of thousands of game and song birds. A copper mining company nightly turned flashlights on its smokestacks, which caused a heavy toll of death among migratory birds who, blinded by the lights, collided with the stacks. The Scouts were successful in having the lights turned off during the flight season.

This was a fine good turn to wild life, and it is gratifying to realize that it is only one among thousands of such good turns that Scout troops are systematically practicing. In the Report of the National Court of Honor, the records of the three awards of the Honor Badge of the Wild Life Protection Fund are published. This fine type of service is particularly Scout-like and should be encouraged. Here are other good turns to wild life reported to the National Office:

Connellsville, Pa., Troop 6. Fed wild game.

Springville, N. Y., Troop 24. Conservation wild life, building bird houses, etc.

Rutland, Vt., Troop 1. Regular bird feeding.

Windsor, N. Y., Troop 1. Land posting campaign for wild life.

Lancaster, Mass., Troop 1. Maintained bird feeding stations.

Oak Park, Ill., Troop 32. Troop had a bird observation contest in the spring.

Hamburg, N. Y., Troop 6. Conducted bird house contest.

Lowell, Mass., Troop 33. Fed birds and placed bird feeding stations in wood during winter.

Woonsocket, R. I., Troop 1. Entire troop turned out to feed birds in woods last winter.

Toluca, Ill., Troop 1. Taught other boys to stop killing birds.—Boy Scouts of America, Report of Chief Executive for 1927.

ASSOCIATION STATES AIMS

The aims of the American Wild Fowlers concisely given are as follows:

1. To interest all persons or groups of persons in the intelligent preservation and increase of migratory wild fowl in order that legitimate sport and a supply of game food may be permanently insured.

2. To assist the Biological Survey in those of its policies approved by the Executive Committee of the American Wild Fowlers, and resist legislative efforts designed to impede or cancel the functional authority of the Biological Survey to administer the migratory bird life of the nation.

3. To cooperate with all state game departments, state sportsmen's associations and organized wild fowl interests in legislation consistent with policies of the American Wild Fowlers.

4. To demonstrate to the public that the active efforts and interest of sportsmen in the principal element of insurance to the future safety of wild fowl.

5. To study and assist in more intelligently demonstrating conditions looking toward an increase in wild fowl life and to remedy conditions adversely affecting them.

6. To urge upon congress legislation necessary in behalf of wild life habitats which can, by national and state supervision, be relieved of conditions adversely affecting their wild fowl, by restoring or creating drainage areas suitable to attract, harbor and feed an increased supply of wild fowl.—Nash Buckingham, Executive Secretary.

DESTRUCTION OF DUCKS' NESTS BY IRRIGATION WATER

Reports have come in from reliable sources that there is about seventy-five per cent loss of ducks and geese on the

marshes of Honey Lake and in Honey Lake Valley due to the flooding of the lands for irrigation at the time the ducks and geese start setting. This increased water floods the nests, preventing the eggs from hatching.

The count of ducks and geese for May 12 in this district showed 2426 birds. The seventy-five per cent loss of half this number multiplied by eight will show a loss of 7203 birds. This is based on the average of eight eggs to the nest. This loss is appalling and it is a question whether or not is occurring all over northern California where ducks and geese are nesting in irrigated districts.

Motion pictures were obtained of this destruction and it is hoped that by showing these pictures at the farm centers along with a lecture, it will be possible to induce the farmers to turn on the irrigation water early enough so as to catch the birds building their nests and make them move to higher grounds.

This loss must be curbed and in so doing the cooperation of the farmer is essential.—C. O. Fisher, Susanville.

PROTECTING ORCHARDS FROM DEER

Soaking strips of woolen cloth in sheep dip and hanging these strips by means of wire in trees has been found a successful means of keeping deer away from orchards. One strip of cloth saturated in sheep dip to each tree is sufficient. The cloth should be so placed that it does not come in contact with the bark of the tree. At the end of six weeks it is necessary to resoak the cloths, but this is a simple matter.

This method is not only cheaper than spraying, but more effective. In spraying, evaporation takes place. Consequently, the trees must be sprayed frequently.—J. D. Dondero, Lakeport.

CAUSE OF RUFFED GROUSE EPIDEMICS STILL UNKNOWN

Attempts to rear ruffed grouse in captivity on a practical scale have met with uniform failure according to a report made by Dr. A. A. Allen who has conducted the investigation for the American Game Protective Association in cooperation with three eminent eastern parasitologists. Eight different methods, each given a fair trial, have been disappointing. Now no hope of success is entertained by the investigators until further understanding is gained of the diseases or other causes for the disappearance of grouse periodically from their native covers.

It was believed in 1924 that periodic epidemics were due to the stomach worm, *Dispharynx*, a parasite which proved especially deadly to pen reared birds. However, cooperative experiments and investigations showed that this parasite could not be the sole cause as the organism was not found out of New York and the New England states.

Over 1500 specimens have so far been examined and some twenty different parasites identified. Yet to use the words of Dr. Allen, "The work has been discouraging, I am frank to admit; we have worked for a good many years and have not gotten very far, except that I think now we do know about what the normal condition of the grouse is, and if we should get into an epidemic year we might be able to determine the organism. Whether or not we would be able to do anything about it is open to conjecture. We can make no promises; all we can promise is that nothing can be done until we know something about it."

A SOLUTION SUGGESTED

The opening of the trout season in Los Angeles County saw thousands of men and women in the far reaches of our mountain streams. Many limits were taken. Very few trout were over six or seven inches. The water in the San Gabriel and its tributaries, which are the only important streams in Los Angeles County, is very low at this time of the year.

I have spent many days along these streams since the trout season opened and I do not hesitate to say that it would be a fine thing to close part of these streams for at least two years. I have noted the small fish. Men and women may be seen in the streams using very small bait and very small hooks, jerking out the little two- and three-inch trout. By closing a part of these streams for a couple of years, we would again have some real trout, if we could give our fish time to grow to a fair size. I feel sure that the limit could be reduced to fifteen instead of twenty-five. As a matter of fact, I have checked several catches since the opening day and in some instances, the limit was found and not one fish over six inches long. It would be more sport and assuredly more merit to catch fifteen trout twelve to fourteen inches long than to catch twenty-five trout, six inches long.—R. E. Jeffries, Monrovia, California.

WHAT DEER EAT

A recent article by Joseph Dixon has contributed many valuable facts as a direct result of careful observation of the

food habits of deer in Yosemite Valley.* Material was gathered in preparation for a more extended investigation of the subject and the study of competition between deer, cattle and sheep on the grazing lands of the national forests in California.

The Forest Service estimated 227,145 deer, 414,199 sheep and goats, and 168,455 cattle and horses grazed in the national forests of California in 1925. The Forest Service estimates 605,964 deer in the national forests of twenty-six states, one-third of which are found in California.

Full knowledge of the grazing requirements of deer as well as domesticated

during June, 1926. This was supplemented by the author during the 1927 summer season in the same locality. Yosemite was selected because the natural conditions presented there remain unchanged by domestic stock. Deer there have become reconciled to human beings, making the study much easier and closer observation could be carried on. The camera could be used as a means of recording the food plants.

The paraphernalia used was a notebook, pencil, binoculars, watch and camera. Herbarium specimens were taken from the identical plants upon which the deer grazed and browsed. Another meth-



FIG. 69. Western mourning dove responding to protection by nesting in a pen at Yountville Game Farm. Photograph by Milton Clarke, April 20, 1928.

live stock must be had before the proper administration of grazing lands can be carried on economically. California can profit by the serious situation that has developed in the Kaibab National Forest in Arizona, where grazing complications are already in evidence.

Professor A. W. Sampson of the Division of Forestry at the University of California carried on investigations as to just what deer eat under natural conditions

od was used by the author to express the food preferences of deer. The number of deer that browsed upon each species of plant and the time spent in browsing was noted. By multiplying the number of deer selecting any species of plant by the minutes spent browsing on that plant, the result is designated as "deer minutes." Such observations made daily for a period of two weeks, after being computed, actually made it possible to say what deer ate in that locality at that time of year.

* Dixon, Joseph. 1928. What deer eat. American Forests and Forest Life, vol. 34, no. 411, pp. 143-145, illus.

Many obstacles were encountered in identifying plants, due to shyness on the part of some deer, and the difficulty in determining positively the species of fine grass being selected from a clump of herbage. The 17-inch F.5.4 Ross telecentric lens and a reflecting camera helped much in identification. Deer feed principally in early morning or after sundown, hence it was necessary to use an open lens and fast plates to secure good photographs.

The food varies much with the season. Many observations will therefore be necessary in several regions before a definite complete report could be made. Deer fed on fifty different plants in Yosemite during the summer. At that season, browsing on deer brush (*Ceanothus integerrimus*) was only noted once. During winter this is known to be one of the favorite foods.

Deer were not observed to touch azalea or larkspur, which is said to be poisonous to cattle and sheep. Cow parsnip and other poisonous plants were not even touched. Green manzanita (*Arctostaphylos patula*) which is generally supposed to be off the deer menu was eagerly sought by an undernourished buck. California laurel, a tree in the same category, was also eaten.

Mr. Dixon believes deer are apt to browse a little on almost any kind of plant, and refuses to say that they never eat this or that plant.

Sixty per cent of plants eaten by deer are taken by sheep and over fifty per cent are grazed by cattle. Competition is, therefore, certain.

Plans are being made to build up a reference collection of plants eaten by deer with photographs of the actual feeding process.

Plants in the order of their importance as deer food are as follows: yard weed (*Polygonum aviculare*); meadow fescue (*Festuca elatior*); Spanish clover (*Lotus americana*); western chokecherry (*Prunus demissa*); California black oak (*Quercus kelloggii*); velvet grass (*Holcus lanatus*); curly dock (*Rumex crispus*); horseweed (*Erigeron canadensis*); green manzanita (*Arctostaphylos patula*); deer brush (*Ceanothus integerrimus*); sneezeweed (*Helenium bigelovii*); California dogwood (*Cornus californica*). Careful records were made of the number of deer feeding upon each of these twelve species of plants, the duration or extent of browsing set down in minutes. Hence, the "deer minutes" were easily computed showing which plants were most preferred at that time of year.—D. D. McLean, Berkeley, California.

A PLEA FOR SHOREBIRDS

All interested in migratory wildfowl will find satisfaction in reading an interesting bulletin published last fall by the United States Department of Agriculture.* The bulletin gives an account of the present status in South America of the snipes, sandpipers, and plovers that migrate in winter from North America to points south of the equator. Dr. Alexander Wetmore, now assistant secretary of the Smithsonian Institution, is the author. The report covers results of a series of investigations in Argentine, Uruguay, Paraguay, Patagonia and Chile. The pampas and coast of South America furnish wintering grounds for no fewer than twenty-four species of migrant shorebirds, which are either resident or migratory in the United States.

In the bulletin one may read regarding the finding in their winter haunts of such birds as the sanderling, greater and lesser yellowlegs, spotted sandpiper, Hudsonian curlew, and the golden and pileolated plover. Just as settlement has brought about unfavorable conditions in America, so in like manner changing conditions are to be noted in the Argentine and neighboring countries. In addition it was found that all kinds of birds are hunted extensively. Nongame, as well as game birds, are hunted. Ducks and tinamous are offered for sale in the markets of Buenos Aires and are included on the menus in the principal restaurants. Legislation for the protection of birds in the republics of southern South America is in somewhat the same stages as it was in the United States thirty years ago. A few laws have been recently passed but the public in general has not yet been educated to their observance.

The bulletin points out in conclusion that some of the species of shorebirds are now practically gone and the outlook for certain others is gloomy at best. More laws and better enforced ones in the countries to the south will aid greatly in assuring a future supply of valuable game birds, now so nearly gone that they are given total protection in the United States.

GAME LAW ENFORCEMENT

A search of court records nowadays indicates that the public believes in game laws and believes in their enforcement. An editorial in the *New Mexico Conservationist* (March, 1928) vividly calls attention to the fact that game resources

* Wetmore, Alexander. 1927. Our migrant shorebirds in southern South America. U. S. D. A. Tech. Bull. 26, 24 pp. 6 figs.

constitute a publicly owned asset just as state lands, public buildings and highways are:

"Try fencing and plowing up the section of highway running through your land, or tearing down the neighborhood schoolhouse for firewood and see what an outraged public sentiment will do to you. Go into the city zoo and shoot down a deer and you will not be charged with illegal deer killing unless the maximum fine for that offense happens to be higher than the penalty for any other possible charge that could be brought.

"The public is beginning to realize that between killing a deer in the zoo and killing one illegally in the woods the difference, if any, is one merely of degree. Both belong to the public and are for the enjoyment of the whole people. The public has decreed that each of its members may use the wild life resource in a certain prescribed manner, which prescription is designed to admit of maximum use and avoid destruction. To deviate from this manner results in an injury to the balance of the public, and, luckily for posterity, the public will no longer stand for it.

You may give your children an education in the schoolhouse; you may dance in it or hold a box supper there, but you may not take the window sash from it to use in your home. It's against the law, and it's a good law.

"It is also against the law to take more than our share of the game, but we are just now beginning to admit that it, too, is a good law."

SPORTSMEN VERSUS LANDOWNER

The need of taking steps to bring about a better understanding between the landowner and the sportsman was emphasized in a report made during the annual conference of the American Game Protective Association held in New York in December, 1927. The report urges sportsmen to make an ally of the former, points out the similarity of their interests and draws a distinction between the true sportsman and the "mere shooter" who is a constant source of annoyance to the farmer and who persistently transgresses the landowner's rights.

The following excerpts are taken from the spring issue, 1928, of the *Maryland Conservationist* in which the report of the Committee on Relations of Sportsmen and Landowners appears:

"The true sportsman will be and is anxious to help the landowner restrain the irresponsible, to assist in patrolling his premises and furnishing him protection. He will join with the owner in the expense of planting food for game and hedge rows along the fences, and in the control of vermin which is destructive to game and domestic poultry. In other words the landowner and the sportsman can legitimately and profitably cooperate to the fullest extent, to the end that both will receive many benefits. The owner will be relieved from vandalism, and be protected from marauders. The game, which is an asset to his property, will be conserved and increased, insectiv-

orous birds, which are essential to crops, will be preserved, and the sportsman, in return, will occasionally have the privilege of enjoying a day in the field.

"All who go afield must recognize the fact that good sport can not be had for nothing, and like the automobile or other desirable means of pleasure and recreation, it has to be paid for. It is a form of recreation which can no longer be obtained free. Recklessness in destroying wild life without any care for the future should be universally and most severely condemned, and all sportsmen should recognize the fact that effective methods of maintaining the supply, such as are employed in agriculture and stock-raising, must be applied. The following is a quotation from a letter from Mr. L. J. Taber, president, National Grange, dated November 3:

'For years we have enjoyed the lavish bounty of nature without making any return; every individual sportsman must now realize his individual obligation to replace what he takes in his sport.

'Therefore, the necessary steps to develop good will between the landowner and the sportsmen are, first a recognition of the farmers' rights. Courtesy and common sense are essential. Local sportsmen's associations should prove their belief in fair play by helping to prosecute game law violators and trespassers who injure farm property. Local sportsmen's associations should have standing committees to cooperate with the Grange, the Farm Bureau Federation and other farmers' organizations for the promotion of better understanding. Farmers should be invited to affiliate with all sportsmen's associations and to participate in all their social events in order that leaders of thought and sentiment of both may become better acquainted and thereby be better able to meet on a basis of mutual friendship and understanding. State-wide sportsmen's organizations should work with state and county farm organizations, so that the farmer will come to realize that the sportsman is ready to meet him more than half way in adjusting all difficulties and misunderstandings.'

A NATURE ALMANAC*

One of the reasons why nature education has not been more widely utilized in the schools is because of a lack of suitable outlines and programs. Furthermore, it is seldom possible to find summarized information regarding advances in nature education. Both types of information brought up to date are to be found within the covers of a new volume entitled, "The Nature Almanac, a Handbook of Nature Education," edited by Arthur Newton Pack and E. Laurence Palmer. This book was written keeping in mind the general aims of a nature course and the need for a course which does not require a special time allotment on the daily program.

* Pack, Arthur Newton, and Palmer, E. Laurence. 1927. The nature almanac and handbook of nature education. (American Nature Association, Washington, D. C.) viii, 312 pp., illus.

An introductory chapter by Mr. Pack, president of the American Nature Association, points out some of the aims of nature education. After a nature calendar, which suggests objects worth seeing at the various times of the year, there follows short reports on various nature activities in the United States. It is quite evident that California does not stress nature education as do many eastern states. Various societies and character building organizations report on their contributions to the subject. Four pages are devoted to the science museums of the United States. The subject of nature guiding and of nature education in summer camps is also discussed. After a review of work accomplished in the various states, a school nature outline gives many helpful suggestions to teachers. In each case references to *Nature Magazine* are indicated. Suggestions are grouped for the first two grades, third and fourth grades, and fifth and sixth grades, each with enlarged scope. The book ends with an up-to-date bibliography grouped under the headings of: texts, bird study, earth and weather study, fungi, ferns and other flowering plants, flowering herbs, insects and their kin, mammals, reptiles, stars, trees and forestry. There are but four illustrations contained in the book all in the forms of cartoons.

Here, then, is a compendium of information of just the kind which the average nature study teacher needs to have in order to keep abreast of the times, know what other people are doing, and have at hand the materials suitable for use in furthering nature education.—H. C. Bryant.

GAMEKEEPERS' SCHOOL ESTABLISHED

A gamekeepers' school for the purpose of training men who can take charge of game bird raising and game restoration work for state commissions, agricultural colleges, private estates, and sportsmen's organizations is being established in an appropriate location of 1400 acres near Clinton, New Jersey, by the Game Conservation Society of New York City. It is believed that the time has come when the country needs men who are specially trained along this line. It is now impossible to fill the demands for gamekeepers from clubs and private estates and trained men are often imported from Europe to take charge of such work. The school is being established in the east where there is greater need for game restoration than in any other part of the country. It is directed by men who have demon-

strated their ability to build up preserves and put them on a profitable basis.

The school is open to men over eighteen years of age who desire theoretical and practical education in the production of game.

The full course of the school, according to present plans, is two years. This period, however, will undoubtedly be considerably modified and eventually become dependent upon the ground work that each individual has had before entering the school.

There is no charge for tuition, books or practical equipment, but the individual is expected to pay his board, lodging and laundry, which, it is stated, can be had on the preserve at an expense not to exceed \$400 a year.

Sixteen states are represented in the first class which began April 15. A number are college graduates and have an excellent foundation on which to build. An appreciation of the economic value of game has spread to colleges. Several states are seriously considering making it a part of their regular agricultural course.

Quoting from June, 1928, *Forest and Stream*: "The course in practical game breeding covers the quail and its propagation both by hand rearing and semi-wild rearing; practical experience in the handling and breeding of stock, the preparation of grounds, the control of natural enemies, food problems and the adaptation of the successful English Euston System to American conditions.

"There will be a similar course devoted to the wild turkey, the Hungarian partridge, the pheasant and the more important varieties of waterfowl—ducks, geese, swans, etc.

"The student at this school will receive careful instruction in natural history, a comprehensive training and experience in the practical side of game breeding—covering the construction of pens, box traps, nest boxes, and other implements used in the production of game. In addition, they will be thoroughly trained in the art of trapping and the general control of vermin, the handling and training of dogs and the use of sporting weapons."

NESTING HABITS OF BAND-TAILED PIGEON*

An interesting account of the personal observations of the nesting habits of the band-tailed pigeon is given by Mr. Albert

* Stillman, Albert E. 1928. Nesting of the Band-tailed Pigeon. *American Forests and Forest Life*, vol. 34, no. 413, May, 1928. pp. 267-268, 300, illus.

E. Stillman in the May, 1928, issue of *American Forests and Forest Life*. According to the author, while the pigeon breeds in small numbers in southern California, not much has been written on its nesting habits. Location of the nests is difficult and observation even more so, as the birds are careful not to betray their location. The male does not perch too near it, and the female does not flush from it unless danger threatens.

Mr. Stillman's observations were made while residing several summers in a cabin on the top of Bushnell Mountain, in the coast range, near Mesa Grande, California. The cabin was surrounded with white oaks in which were many western gnatcatchers and California woodpeckers, together with band-tailed pigeons, "that roosted in the lonely oaks, even homing high on the mountains."

It is interesting to note Mr. Stillman's account of his first seeing the female pigeon early in July with nest building material fly into a manzanita bush across the canyon, followed shortly by the male, and the difficulty that Mr. Stillman had in locating the nest, together with the unique experience that eventually led to its discovery: "We explored the woods for more than two weeks before it was discovered by mere chance. We were collecting pine cones in a tree about twenty feet high. It happened that my belt caught on a dead limb, and as I gave the limb a shake, a band-tailed pigeon left her nest on the horizontal branch of a black oak, several feet away, and alighted in the top of a nearby pine tree. A moment later we were looking at our first band-tailed pigeon nest. We never would have seen it had the bird kept her place. The nest was no more than fifteen feet from the ground and about twenty-five feet from the trail."

The nest is described as being rather bulky, a mere pile of about one hundred and fifty oak and squaw-bush twigs, ranging from a sixteenth to a quarter of an inch in diameter.

Much time was spent in trying to obtain the birds' confidence, in which Mr. Stillman was finally successful, enabling him to approach as close as two feet and to make some of his notes from a camp stool within three feet, and eventually, within one week, the author sat at the foot of the tree and watched the mother bird's operations.

"In September the baby pigeon was in the nest; its dark skin covered with soft, cottony yellow down, gave it the appearance of a gosling. As I watched, the mother bird flew to a pine tree on the

other side of the trail. Then, with a loud clapping of wings, she darted to a branch beside her nest. Frequently I saw her stretch herself out so as to obtain a better view of the nestling. Presently she entered the nest and gave the food to her young."

Not wishing to disturb the pigeons, the next visit to the nest was made after four days, shortly after sunup, and the pigeon was found beside her nest directly overhead. "The baby bird was strong and active. An adventuresome little fellow he was, wriggling to the nest-edge to be fed. Later, undisturbed by our presence, he huddled down among the small twigs, closed his eyes, and dropped off to sleep."

"When the baby pigeon was small, the mother stayed near the nest, often sheltering it with her wings during the midday heat; but when it was about ten days old she remained away from the nest for hours at a time. The male was observed about the nest only twice."

When the young bird was two weeks old the nest was visited by the author and Mr. Clinton G. Abbott of the Natural History Museum of San Diego, who after making friends with the nestling succeeded in photographing same.

"The following day the old pigeon left the oak tree in the early morning and returned at twilight. Next day she left at daybreak and returned at sundown. For more than a week after that she was not observed at the nest except in the late afternoon * * *. Early in October the young bird left the nest. With folded wings it sat on a small branch of the oak, where it remained until late in the afternoon. That night it roosted on the high limb of a nearby pine tree. The following day it left the neighborhood and I did not see it again."

A short time later Mr. Stillman discovered another band-tailed pigeon sitting on her nest about ten feet above the ground in a live oak tree near a country road. This nest was remarkably well constructed of oak twigs and had a thick lining of pine needles and contained one egg.

Mr. Stillman was unable to make continuous observations of this nest for more than one week, but from data gathered from another source, it is reported that a severe thunder storm swept across the mountain and on the day after the storm the mother bird was seen brooding but that she left the nest and did not return to it. It is understood that it is not the ordinary habit of the bird to brood so late in the season, and "that the date of

my finding, October twelfth, established a new late nesting record of forty-eight days for the band-tailed pigeon in California."—Bessie W. Kibbe.

CARP CATCH INCREASED BY NOVEL METHOD

The German carp has gained a bad reputation and is suspected as a destroyer of the spawn of game fishes. For this reason any method devised which will greatly deplete the numbers of these "rough" fish at once wins the approbation of those who would conserve the more desired species. The Minnesota Fish Commission permits seining in carp infested lakes during the winter months and carefully supervises the operations to prevent game fish from being removed. The carp taken are shipped to the larger eastern cities where they are in considerable demand during Jewish holidays.

In an article in the *Fishing Gazette* (vol. 45, no. 5, p. 18), George Roger Chute tells of the innovation in the method of seining which resulted in such a phenomenal catch during the past winter.

"The belief has always been prevalent that in winter the carp gather in the deepest parts of the lakes, and can there be seined. But this year it has been learned that a high percentage of the fish of the lake actually are to be found close under the ice, at the very edges of the water. Whether the fish are feeding there or are seeking air is a matter of conjecture, but the seiners have found that by the old process of passing their nets, a great proportion of the fish escaped by never being within it.

"Cultivating an ice field may seem a strange farming operation, but in Minnesota it has been found productive of a bounteous crop of carp. The fisherman there mounts to the driver's seat of a big disc harrow, whips up his horses shod with ice calks, and proceeds around the perimeter of the water-body to be seined. The cutting discs of the steel harrow chisel and grind against the ice, grooving the surface, gouging out irregularities, and creating withal a rattle and chop which must be most confounding and frightful to the fish just beneath. At all events, we are assured by the seiners that the stampede of the strayed fish is as precipitous as their terror is complete, and that by the time the howling harrow has made the rounds of the lake shore once or twice, every carp capable of locomotion has fled to the central depths of the pond, there to huddle with his fellows, seeking gregarious protection, and witlessly laying himself directly in the path of the seine's deep bunt as the gear is circled about.

"The discovery of this novel method of fish-driving has resulted in great gratification to everyone connected with the business. It has literally netted a greatly increased catch with a correspondingly enlarged return to the seiner and to the state; it has caused a far more efficient and thorough ridding of the lakes of undesired species."

WOOD DUCKS INCREASING

Since the wood duck has been accorded complete protection, it has been slowly but steadily increasing and a few definite notes may be of interest. In talking with Dr. Robert Cushman Murphy at the meeting of the American Ornithologists' Union he said that wood ducks were the most abundant ducks in California, where he had just been on a duck hunt. That is, of course, far away from Ontario, but on a visit to Point Pelee on December 21, I was told by a resident who is a conscientious conservationist, that, on the opening day of shooting, these ducks were the most abundant of all and that very many of them were killed. Unfortunately the perpetrators escaped in every instance, and my informant belonged to one of the few parties that refused to kill them. On my return home (London, Ontario) I found awaiting me a memorandum regarding a wood duck, and on December 25th I saw the bird itself, which had doubtless been wounded during the shooting season and had lived on my own lake until it froze over. It was flushed by a man on the 22d and scuttled over the ice towards the open water, but was brought in by a dog, uninjured. But it is doubtful that it will recover and probably will never be able to fly. These ducks were regularly seen at my place from August onward.—W. E. Saunders in *The Canadian Field Naturalist* (vol. 52), February, 1928.

REFUGES MOST IMPORTANT IN SAVING WILD LIFE

Establishment of sanctuaries for birds will do more for their welfare than any other one thing, Paul G. Redington, chief of the Bureau of Biological Survey, United States Department of Agriculture, told the members of the Izaak Walton League, a national organization of persons interested in hunting and fishing, at their annual convention in Omaha, April 20. "While restrictions are necessary," he said, "I feel that I am safe in saying that they take second place to a carefully worked out system of refuges, and I am glad to say that progress has been made in this respect within the last year."

"Unanimity of the League and other sportsmen in favor of the flooding of the Bear River marshes of Utah has brought results in the current session of congress," Mr. Redington said, and legislation to make the Cheyenne Bottoms in Kansas a permanent refuge for waterfowl is now pending. Also before congress is legislation to hasten completion of the purchase of land within the Upper Missis-

issippi River Wild Life and Fish Refuge, which Mr. Redington said, "was conceived and made possible by the influence of the Izaak Walton League of America." Another measure for which the League has worked is the McNary-Sweeney Bill for a study of relationships between the forests and wild life. The Budget Bureau approved it as did the senate committee. "We are all hopeful," he added, "that the bill may be put on the statute books at this session of congress."

In particular Mr. Redington thanked the league and other sportsmen for the aid they gave the Biological Survey in one of the central states where violations of the Migratory Bird Treaty Act were numerous and where attempts had been made to do away with the game warden and to demolish his power boat. The League sent letters to all chapters in the state urging support of the authorities, and a notable improvement followed.

Mr. Redington's address reviewed many of the activities of the Bureau of Biological Survey for the past year and needs and plans for the future. "The federal government alone can not be depended upon to solve the many problems of wild life administration." Facts and cooperative effort are needed, to provide a basis for a long-time program of conservation, including studies of food habits of migratory birds of which only a few have been completed, and which will be a guide to formulation of a refuge program. Other activities have been surveys of areas available for refuges; studies of propagation of game birds; plans for studies of the feeding habits of animals along lines similar to those undertaken in connection with the Jackson Hole elk; the organization of the waterfowl census, which is now under way and enjoying the cooperation of sportsmen throughout the country; and the bird banding work, in which more than 1200 sportsmen and bird students are aiding the bureau. In this connection Mr. Redington mentioned that ducks banded on the celebrated Cheyenne Bottoms of Kansas were retaken in 16 states, three provinces of Canada, in Alaska and in Mexico.

Mr. Redington also made a plea for sympathetic support of the new Alaska Game Commission. "Seldom has such an opportunity been given to those interested in the perpetuation of our big game animals to unite their efforts in the establishment of a well-balanced and effective game administration program as can be done in Alaska."

IMPORTED WILD BIRDS NOT EASILY ESTABLISHED HERE

Importations of foreign birds for the stocking of game coverts, or in the hope of adding to the variety of bird music in the woods, or for warfare on insect pests, have led to strange and unexpected results. Probably few persons anticipated that the English sparrow would thrive and multiply and spread itself over the whole continent as it has since the first scattering importations were made on the Atlantic coast in the early 1850's. On the other hand, bird lovers, sportsmen, and state game authorities have spent thousands of dollars in efforts to acclimatize and establish desirable varieties of game birds. Reckoned by number a large proportion of the attempts have failed. Sometimes the birds have simply disappeared and were never seen again, leaving the importers wondering whether they may have migrated or fallen prey to disease or animals in the new environment. At times sportsmen have grown crops on game preserves with the expectation of allowing the birds to harvest the crops and enjoy a favorable chance for colonization. In other instances, birds have seemed to settle down and nest and reproduce satisfactorily for a year or more, only to vanish a few years later, apparently gaining stamina and reproductive power for a few years only to lose it later. The English sparrow increased in numbers and in range for perhaps 30 to 40 years when it reached a peak of abundance and was considered a serious pest. In recent years, these birds have declined greatly in numbers both in cities and in rural districts, and nature seems to be setting a balance in regard to them.

The foregoing is representative of the general discussion of the subject that Dr. John C. Phillips offers in a 64-page pamphlet, "Wild birds Introduced or Transplanted in North America," just published by the United States Department of Agriculture as Technical Bulletin 61-T. Dr. Phillips has cooperated with the Bureau of Biological Survey, and has collected a great quantity of records and reports that he summarizes briefly for each species and variety for which he has been able to gather facts. He prefaces his report with the statement that "the early history of the introduction of foreign birds into this country is mostly clothed in darkness. The records of many attempts, if such there were, have long since been buried in back numbers of

local newspapers, and if any experiment was successful it was soon forgotten." For the most part he has depended on the files of sportsmen's magazines, the records of the Biological Survey, and supplementary correspondence with many bird lovers and biologists in various regions where birds have been liberated. Since 1900 the records of the Biological Survey are a complete guide to importations. Many birds imported as cage birds have been freed or have escaped and some have established themselves in favored localities.

One principal use of this bulletin, the author believes, will be to record and bring to the attention of those who attempt to acclimatize birds a record of the failures with the same or similar birds, and so prevent waste of money in ill-considered introductions.

Doctor Phillips devotes several pages to the various kinds of quail, including the bobwhite, and tells how these have been moved about from one section to another, sometimes successfully but often unsuccessfully. Massachusetts sportsmen began comparatively early to import quail, first from the Ohio Valley, later from Kansas and the Indian Territory, and still later from Mexico. When Mexican birds were first imported the prices ran as low as \$1.50 a dozen. Later the Ohio Valley and even Oklahoma and Texas, which were at one time dependable sources of supply, also found their game so depleted that they in turn bought to restock. From 1910 to 1925, the author reports, more than 233,000 Mexican bobwhites are recorded as having entered the United States, and the price has steadily risen to \$24 to \$36 a dozen.

In the new bulletin the author gives facts concerning importations and acclimatization experiments with more than 100 species and varieties of wild birds. Technical Bulletin 61-T may be obtained free upon application to the United States Department of Agriculture, Washington, D. C.

UPPER KLAMATH WILD LIFE REFUGE ESTABLISHED

By recent executive order, President Coolidge has set aside for use as a refuge and breeding ground for birds and wild animals an area in southern Oregon embracing certain unappropriated public lands near the upper end of Upper Klamath Lake. The new reservation will be known as the Upper Klamath Wild Life Refuge and will be administered by the

Bureau of Biological Survey of the United States Department of Agriculture.

All the lands involved have been withdrawn for reclamation purposes in connection with the Klamath irrigation project in Oregon and California and, as with other reclamation projects set aside as wild life refuges, are primarily under the jurisdiction of the Bureau of Reclamation of the Department of the Interior. The reservation of these lands as a bird refuge therefore is subject to use by the Bureau of Reclamation for irrigation and other purposes.

About 5200 acres are included in the refuge, which extends as a rather long, narrow strip between the Crater National Forest, embracing the high mountain range bordering this part of the Klamath River Valley on the west, and Upper Klamath Lake. The refuge area consists mainly of marshland containing a dense growth of tules, sedges, and other aquatic vegetation and affording abundant cover for the nesting wild fowl of the region. The marshes and the more open water areas also included will provide important feeding and resting grounds for migratory waterfowl, especially wild ducks and geese.

The establishment of the refuge will be of great importance to the waterfowl of the region, in view of the fact that there has been such extensive drainage of marsh areas in that general section in connection with the reclamation of lands for agricultural purposes. The reservation will be of great interest to conservationists generally as well as to sportsmen who are familiar with the drainage operations that have led to the practical elimination of Lower Klamath Lake, embracing about 80,000 acres and formerly one of the most important breeding grounds for resident waterfowl and feeding and resting grounds for migratory waterfowl in western North America. The creation of the refuge at Upper Klamath Lake will in a way serve to offset the disappointment that many felt because of the impracticability of reflooding Lower Klamath to save it as a wild fowl haven.

The development of wild life refuges in this general section will provide for the needs of the birds on an important migration route near the Pacific coast. The new refuge will also extend needed protection to fur-bearing animals. It is unlawful, within the reservation, wilfully to set on fire any timber, underbrush, or grass, or after building a fire to leave it without totally extinguishing it, or to hunt, trap,

capture, or wilfully disturb any wild animal or bird or the eggs of any wild bird, except under such rules and regulations as may be prescribed by the Secretary of Agriculture.

MIGRATORY BIRD TREATY ACT REGULATIONS AMENDED

Amendments to the Migratory Bird Treaty Act Regulations, changing the classification of gallinules, the open seasons in a number of states, and the sinkbox regulation, have been adopted by Secretary of Agriculture Jardine and approved by the President. Gallinules are no longer classified under the open season for wild ducks and geese, being now included in the open season for rails. In Illinois the season on waterfowl will open next fall on September 16 and close December 31, this being in lieu of the former period from October 1 to January 15. In Massachusetts the season on rails and gallinules (except coot) is changed from the period September 1 to November 30 to the period September 16 to December 15.

In South Carolina, Georgia, Florida, Alabama, and Mississippi the open season on mourning doves has been changed from the period October 16 to January 31 to two periods covering the month of September and from November 20 to January 31.

The provision prohibiting the use of sinkboxes in strictly inland waters in the hunting of migratory waterfowl was not changed, but the restriction having application to the distance between sinkboxes, and between sinkboxes and shore lines or islands, has been eliminated. Under the regulations of last season it was required that sinkboxes (batteries) used in the taking of waterfowl in coastal sounds and bays and other coastal waters be placed not less than 700 yards from the shore line of the mainland at ordinary high tide and not less than 700 yards from any island at ordinary high tide and not less than 700 yards from any other sinkbox.

FOREST SERVICE PLANS NOVEL CAMPAIGN

"What Price Fire," a thrilling motion picture showing how Dan Crockett, a miner and packer won an uphill fight against the red enemy of the forest, will be the main attraction of a fire prevention campaign to be put on by the U. S. Forest Service in northern California this summer. The picture was taken in the Mt. Shasta, Klamath River and Marble

Mountain regions of Siskiyou County, with local settlers as the leading actors, and contains many beautiful shots of noted scenic attractions, game animals and birds, and high mountain country.

The educational fire prevention campaign will start at Redding May 22 and will cover 115 cities and towns within and adjacent to the Shasta, Klamath, Trinity and California National Forests, and along the Redwood highway from Crescent City to the San Francisco Bay region. A show will be given each night, except Sunday, in different towns and will be free to all. In addition to the three-reel story, "What Price Fire," there will be a movie entitled "She's Wild" with bronco-busting, steer roping and tying, and other exhibitions of cowboy prowess at a frontier day celebration, and a brief talk illustrated with beautifully colored lantern slides, showing the loss by fire of valuable timber, recreation, and fish and game resources.

To carry on this campaign in northern California, the Forest Service has equipped a truck with an electric generator, motion picture projectors, stereopticon lantern, screen, and other necessary paraphernalia for putting on a complete movie show not only in large towns but even in out-of-the-way settlements. Asher Ireland, an officer with 18 years of experience in the forest service, will direct the campaign.

BEAR RIVER MARSHES, UTAH, SAVED FOR MIGRATORY BIRDS

Carrying authorization for an appropriation of \$350,000, the Bear River Migratory Bird Refuge Bill, which has been pending in congress for the past two sessions, has been approved by President Coolidge. This important conservation legislation authorizes the Secretary of Agriculture to construct at Bear River Bay and vicinity, Utah, such dikes, ditches, spillways, buildings, and improvements as may be necessary for establishment of a suitable refuge and feeding and breeding ground for migratory wild fowl and to acquire, by purchase, gift, or lease, water rights and privately owned lands necessary for the purpose.

The Bear River Marshes, on Bear River Bay, comprise the greatest wildfowl area of its kind in the Rocky Mountain region and form the gathering place for millions of wild ducks and geese during their north and south migrations. The new law seeks to improve conditions at Bear River Bay so as to prevent a recurrence of the enormous losses of mi-

gratory wild fowl that have resulted from the concentrated alkaline waters there. It is estimated that in the past few years not less than 7,000,000 ducks alone have perished, owing to scanty rainfall and the diversion of water for irrigation purposes from Bear River and other streams tributary to the marshes in that district, the shallow waters in many parts of these marshes during summer and fall of each year becoming concentrated solutions of alkali.

The building of dikes and other improvements to store waste fresh waters, now flowing into Salt Lake, for the purpose of reflooding the Bear River Marshes will eliminate the death areas and afford a breeding ground for great numbers of the birds. Instead of a death trap the area will become a supply point for the surrounding region, producing vastly increased numbers of wild fowl.

During the summer of 1927, with the cooperation of the Associated Sportsmen and the United Duck Hunters of California, an engineer of the Bureau of Public Roads made a careful study for the Bureau of Biological Survey of conditions at Bear River Bay. His report showed that the project is entirely feasible and indicated that an appropriation of \$350,000 would cover the cost of the development of a refuge in the region, which will include the marshes of the delta proper and provide for impounding fresh water over the broad marginal flats. The act stipulates that not more than \$50,000 shall be expended for the purchase of land, and that not less than 60 per cent of the area acquired shall be maintained as an inviolate sanctuary for migratory birds.

The Bear River project is primarily the heart of the wild-fowl conservation problem of the 11 states west of the Rocky Mountains, and it has been conclusively shown by the bird-banding operations of the Biological Survey conducted in the region that these marshes form a distributing center supplying migratory wild fowl to all the surrounding states. It is predicted that the food value of the birds that can be saved in a single season, not to mention recreational and esthetic values, will be far in excess of the cost of the proposed improvements. Sportsmen and conservationists throughout the country will welcome the measure as a most far-reaching step in the wild-life conservation program. The acquisition of lands for the refuge and its administration when established will be by the Bureau of Biological Survey of the United States Department of Agriculture.

UTAH MAN WILL HEAD BEAR RIVER BIRD REFUGE PROJECT

David H. Madsen, State Fish and Game Commissioner of Utah, has been appointed superintendent of the new migratory bird refuge authorized to be established at Bear River Bay, Utah, under the Bear River Migratory Bird Refuge Bill recently approved by President Coolidge. Mr. Madsen is president of the Western Association of Game Commissioners and has been prominently identified with the conservation of wild life for a number of years. Fully familiar with wildfowl conditions in his state, he has been one of the strongest advocates for the reflooding of the Bear River Marshes and the creation of a refuge there as a means of preventing the annual mortality of birds in the region. Mr. Madsen will take up his new duties on July 2.

The construction work necessary for the reflooding of Bear River Marshes, as provided by the act, will be performed under the direction of L. M. Winsor, Bureau of Public Roads engineer stationed at Logan, Utah. He has been engaged for a number of years on irrigation projects in the west and through his long experience in the Division of Agricultural Engineering of the Bureau of Public Roads of the United States Department of Agriculture is well fitted for the work. Mr. Winsor during the summer of 1927 made a careful study for the Bureau of Biological Survey of conditions at Bear River Bay.

The second deficiency bill, which became a law during the closing hours of the 70th Congress, carried an item of \$200,000 for the construction of such dikes, spillways, buildings, and improvements as may be necessary for the establishment of a refuge for migratory wildfowl in this region so well fitted as feeding and breeding grounds, and to acquire the land and water rights needed for the purpose. This is part of the \$350,000 appropriation authorized in the Bear River Migratory Bird Refuge Act. Plans for the preliminary work of the acquisition of lands and for engineering operations are being developed by the Bureau of Biological Survey which will administer the refuge when it is established.

The Bear River Marshes, on Bear River Bay, comprise the greatest wild-fowl area of the kind in the Rocky Mountain region and form the gathering place for millions of wild ducks and geese during their north and south migrations. The new law seeks to improve conditions at Bear River Bay so as to

prevent a recurrence of the enormous losses of migratory wild fowl, especially ducks, that have resulted from the concentrated alkaline waters there. The building of dikes and other improvements to store fresh water now flowing into Salt Lake, in order to reflood the Bear River Marshes, will not only eliminate the death areas, but will also afford a feeding and breeding ground for great numbers of the birds. Instead of a death trap, the area will become a supply point for the surrounding states, producing vastly increased numbers of wild fowl.

FOX DISTEMPER BEING INVESTIGATED

Frequent requests from fox breeders for assistance in controlling infectious diseases in their animals have prompted the Bureau of Biological Survey of the United States Department of Agriculture to investigate conditions on a number of fox farms. Between the years 1921 and 1926 Dr. Karl B. Hanson and Dr. H. L. Van Volkenberg, of the Division of Fur Resources of the Biological Survey, visited as many infected premises as possible, studying conditions for periods ranging from a day to a week at each. Special note was made regarding the history of the various outbreaks, the rate of mortality, and the class of animals affected, their symptoms and the organs involved.

The source of the disease was directly traceable in the greater proportion of the outbreaks to animals brought from other farms or from fox shows. Whenever a bacteriological laboratory was near at hand, advantage would be taken of the opportunity to send fresh carcasses there for examination. Lack of facilities or funds prevented other studies of the bacteriology or the microscopic injuries caused in these infections.

It was soon found that a very thorough and comprehensive investigation would have to be made of so-called distemper, or of the various diseases known by that name. It was deemed important that the bacteriology and microscopic pathology of the animals affected first be given particular attention with a view to determining the causes of the trouble and working out more accurate methods of diagnosis.

Dr. R. G. Green, of the Medical School of the University of Minnesota, who, with a group of associates had investigated outbreaks on large farms near Minneapolis, visited F. G. Ashbrook, of the Bureau of Biological Survey, in December, 1926, and discussed the work

done at the University of Minnesota. Fresh material in abundance had been available for his use, and each outbreak was kept under close observation throughout its entire course.

A program of cooperative research on diseases of carnivorous animals was entered into between the Biological Survey and the University of Minnesota on October 1, 1927. The work has been carried out under the combined direction of Dr. J. E. Shillinger of the Bureau of Biological Survey, and Dr. R. G. Green of the University of Minnesota. The cooperative undertaking had the benefit of almost three years' earlier work by Doctor Green and his associates. Dr. Earle T. Dewey and Dr. Newell R. Ziegler, who have been associated with Doctor Green since the time he began his fox-disease investigation, have continued as part of the staff of nine workers under the cooperative program.

When the university group started its investigations its activities were directed to the study of a bacterial infection that was present on a number of fox ranches in Minnesota. This disease, known as fox paratyphoid, disappeared in Minnesota and was followed by another, discovered by Doctor Green, and here tentatively called epizootic fox encephalitis, to which investigations are now being directed. An epizootic, it will be understood, is in animals the same as an epidemic in man.

On a number of fox ranches in the northwest an infection known as fox paratyphoid occurred during the fall of 1924 and the winter and spring of 1925. It appeared to be a disease of young foxes rather than adults. On affected ranches the young would die in large numbers, while only an occasional breeding animal would succumb. The mortality in its typical course ran as high as 60 per cent of all the younger animals on a ranch. Bacterial vaccine tended to control the disease on these ranches, and the fox paratyphoid has not been encountered by the University of Minnesota group since the summer of 1925. The very fact that it has disappeared from view is strong evidence that the disease studied was a primary infection, and if so, that it can be expected to reappear in epizootic form sometime in the future.

Following their work on the paratyphoid infection, the university group began investigations of a second disease of foxes that previously was not described or was known under the name "distemper," and now is tentatively being called epizootic fox encephalitis. The

solution of the various problems, especially the development of a preventive vaccine, will undoubtedly require the major efforts of the group for several years to come.

This disease was first encountered in the fall of 1925. It was recognized first in groups of animals that had been immunized with the paratyphoid vaccine. The evidence that foxes so vaccinated were resistant to an infection by the same organism indicated that a new disease was being dealt with in vaccinated animals. Accordingly, transmission experiments were carried on with foxes that had been so vaccinated.

Epizootic fox encephalitis has been present on numerous ranches throughout the United States during the past three years. Outbreaks developed following fox shows at Portland, Me., and Buffalo, N. Y., in 1925, and have been present on many ranches under observation continuously since that time. It appears to be a disease of adult foxes as well as pups, and in outbreaks studied, deaths in adults have been as numerous as among the young. Even on a carefully supervised ranch the majority of animals are found dead even though only a few hours before they were apparently well. Sick foxes when found may show convulsions, extreme weakness, paralysis, or sleepiness. All the various symptoms appear-

ing in ranch animals have been reproduced in animals artificially infected from a single sick fox, showing that all these manifestations are part of the same disease.

The animals dying from experimental infection appear the same in all ways as do the animals dying on a ranch. On a ranch the mortality from this disease does not often exceed fifteen per cent, but a number of epizootics have been observed where it was as high as 40 per cent. Positive diagnosis of this disease has been difficult, and one of the problems confronting the investigators is to find a technique making the diagnosis less difficult.

Considerable experimental work has been necessary to an understanding of epizootic fox encephalitis. Close to 400 animals have been used in transmission experiments, and approximately 1400 sick animals have been carefully studied. Thus far it appears that two diseases of foxes have been encountered, and the group of investigators is not sure but that a third may be discovered as the work goes on. The development of a vaccine for epizootic fox encephalitis is the immediate aim, and it is hoped that a research undertaken by the University of Minnesota and the Bureau of Biological Survey will have the cooperation and support of fox ranchers.

DIVISION ACTIVITIES

Appropriate and distinctive metal buttons and insignia have been secured and will be supplied the field force. These will complete the olive drab uniforms which have been prescribed for the field force of the Division. In adopting a uniform for its fish and game patrol force, California has followed the precedent established by other leading game conservation states, which have found that placing the patrol force in uniform has not only elevated the standing of the force, but has also tended to increase its efficiency. Under regulations, the uniform will be worn at all times except on special missions and investigations requiring concealed identity.

Negotiations leading up to the acquisition of a game farm site for southern California have been completed and plans are under way for the construction of the necessary plant, buildings and equipment, which will permit this farm to be in operation during the coming season.

The Division will conduct a large ex-

hibit at the Pacific Southwest Exposition in Long Beach, July 27 to September 3, depicting the various phases of wild life conservation now being carried out.

As a forward step toward conserving the supply and preventing the waste of sardines, the Board of Fish and Game Commissioners has issued its order establishing August 6 as the opening date of the 1928 season when sardines may be canned. This order was made by reason of the fact that sardines taken prior to this date have so little oil content as to render them unsatisfactory and uneconomical for canning purposes. The order establishing a closed period for the taking of sardines for canning purposes establishes a precedent, but has met with the unanimous approval of the sardine cannery of the state, in a resolution adopted by their association. The action taken here, in all probability, will be followed by legislation establishing an open and closed season for the taking of sardines for the whole state,

The game refuge survey crew under the leadership of A. H. McClellan recently finished the survey of Refuge 4C, located on the line between Riverside and Orange counties. Work on 4C was slow due to the fact that the refuge is described by section and township lines. Brush was so thick that it was difficult to locate monuments. Quail were found to be very abundant in part of the refuge. Deer were found also, but they are not as abundant as in some of the other refuges.

The boundaries of Refuge 4E, the most southern refuge located on the summit of Cuyamaca Mountain in eastern San Diego County were run in May. Posting the boundaries of refuges 4D and 4G was followed by the posting of the northern line of the two big southern California refuges, 4A and 4B.

It is probable that the southern line will not be run until next winter as the summer months can be used to better advantage in the northern section where snow conditions make it impossible to work during the winter.

The 1928 fish planting season opened with a plant made the first two days in April in Captain J. E. Newsome's territory. The fish in the new Mormon Creek Hatchery near Sonora made such a remarkable growth that it was necessary to plant some 100,000 Loch Leven to make room for incoming spawn.

Car No. 01 has made four trips from the Mount Shasta Hatchery laden with fish to be planted in various sections of the state. Captains of patrol made preparations for the reception of fingerlings before the car arrived. Reports show the fish were planted with a negligible loss.

Supervising Captain Brownlow prepared a letter of instructions again this year, which was sent to the field force. Emphasis in these instructions was placed on care and distribution in order to give the tiny finny favorites every advantage possible for survival. Attention has also been paid to trout planting equipment and improvements which it is anticipated will produce good results.

Indications are that low water will be prevalent this year and a warning has been issued to deputies not to plant trout in streams which are certain to go dry. The importance of rescuing stranded fish has also been stressed.

State lion hunter Jay Bruce has bagged ten more lions since the first of the year, bringing his enviable record to a total now of 338 during his activities as a lion hunter.

Efforts to lessen the depredations of lions in San Luis Obispo County did not meet with the success expected. Lion signs were present in Lopez Canyon and Posso, but the weather was so warm that the dogs were unable to work well. After several attempts to induce them to hold to the trail of the lion, it was decided to await a more seasonable time when weather conditions are more favorable.

Little work was accomplished in game refuge 1K, and in the region of the north fork of the Kings River. High water and rushing mountain torrents seriously hampered progress. No lion signs were noticed on Patterson Mountain.

VOLUNTEER DEPUTIES

The appointment and organization by the Fish and Game Commissioners of fishermen, hunters and out-door lovers who are willing to contribute their services as deputies of the Division of Fish and Game to the restoration of sports afield and astream with gun and rod in California, without commercial, political or personal ties, or hope of reward, is undoubtedly the most comprehensive move and program ever undertaken for the protection and conservation of wild life in the United States.

This movement represents a patriotic and unselfish endeavor to save for our children and for future generations that priceless heritage of nature, the fish, game and wild life of the state, in order that they may enjoy the health, recreation and happiness that only the great out-o'-doors can give them.

The volunteer deputies of the division have been drafted from and represent the highest ranks of citizenship within the state, many of them being nationally known, which insures the integrity and high standing of the organization.

Less than two years have passed since the Fish and Game Commission of California established a system for the appointment and supervision of men willing to serve without compensation as deputies of the division for the protection and conservation of wild life, and the enforcement of the laws enacted for that purpose. Yet the services that have been rendered by these deputies have been exceedingly satisfactory and have resulted in awakening thousands of sportsmen and lovers of the great out-o'-doors to a realization of the perils that are threatening the supply of fish and game of the state. They have further materially aided in bringing about the necessity of cooperative action on the part of the sportsmen and the

people in general in the work being carried on for the protection and conservation of wild life, and the enforcement of the fish and game laws, as well as the efforts being made for the restocking of the game fields and public waters.

The Fish and Game Commission has appointed a total of 752 volunteer deputies of the Division of Fish and Game. 347 of these deputies being federal forest rangers and forest fire guardians located in the various national forest reservations within the state. These appointments have been recommended and are sponsored by the United States Forest Service.

Four hundred and five of these deputies are men who have been drafted from the ranks of sportsmen within the state, their appointment being recommended and sponsored by bona fide fish and game protective associations and clubs.

All volunteer deputies of the Division of Fish and Game, except those who are employed by the federal government, are required to be and are bonded to the state in the sum of \$2,500, for the faithful performance of their duties.

The activities of the volunteer deputies of the Division of Fish and Game, except those who are in the employ of the federal government, are, under the system and rules that have been established by the Fish and Game Commission for their control, under the direction and supervision of the captain of patrol in charge of volunteer deputies, and are required to report monthly and to render an account of all of their activities, such as the number of hunting and fishing licenses checked, the number of miles of fields and streams patrolled, the number of arrests made for violations of the fish and game laws, the amount of fines imposed, fish and game conditions observed while afield, etc.

That the cause of fish, game and wild life protection and conservation within the state has been benefited through the activities of the volunteer deputies of the Division of Fish and Game, is indicated from a brief and incomplete summary of the monthly reports rendered by these deputies, which show that during the past two years they have checked a total of 19,102 hunting and fishing licenses, that they have patrolled 314,575 miles of fields, streams, bay shore and coast line, that they have made 428 arrests and assists in arrests for violations of the fish and game laws, for which \$12,168 in fines were imposed.

The action of the men who have, without compensation or hope of reward of any kind, volunteered their services as

deputies of the division, and entered the fields for the protection and conservation of fish, game and wild life and the strict enforcement of the laws that have been enacted for that purpose, is certainly worthy of the highest commendation, and surely deserves the hearty and united support and cooperation of all sportsmen and law-abiding citizens within the state.—Walter R. Welch.

Department of Patrol.

May was a banner month for the patrol department. Deputies by their energy and efficiency greatly increased the number of arrests and fines made. By way of comparison, during the month of May, 1927, 103 arrests were made and \$3,555 collected in fines; while during the month of May, 1928, 252 arrests and \$8,245 collected in fines imposed for violations. It is necessary, however, in all fairness to point out that there is an increase in the patrol force of about one-fifth.

It is now further known that conservation is fast becoming more popular with the people even in the most remote corners of the state. This is reassuring and indicates that much prevention of law violation is being accomplished by the patrol force through their activities in enlightening the people in their districts and impressing them with the need for the protection of fish and game.

Changes in the personnel of the patrol force are as follows:

Lewis T. Ward was appointed captain of the Sacramento district with headquarters at Sacramento to succeed Captain D. E. Roberts, deceased.

Deputy C. L. Bundock, who has been working in the San Francisco office for two and one-half years, was transferred to San Benito County with headquarters at Hollister.

Deputy C. F. Barnes was transferred to Quincy to take the post of Deputy Miner, who has resigned to go into business for himself. Volunteer Deputy E. L. Mercer was appointed regular deputy for the Portola station.

Deputy J. F. French was transferred from Fall River Mills to Redding to assume charge of the district of Deputy Frank A. Greene, resigned. Andrew H. Millett appointed deputy to fill the vacancy left by Deputy French at Fall River Mills.

Deputy F. J. McDermott transferred from the San Francisco office to Santa Cruz County with headquarters at Santa

Cruz. Deputy E. D. Moody, for many years operating in Santa Cruz County, transferred to the San Francisco office.

Volunteer Deputy J. C. Schneider appointed a regular deputy with headquarters at King City to succeed Deputy Frank A. Burke resigned.

Deputy G. L. Hoke appointed deputy at Requa to fill the position left vacant by the resignation of Taylor London.

A list of the deputies is appended on the back cover of each issue of this magazine for the purpose of informing the general public of the locations of deputies.

and the destruction was the only logical disposition that could be made of them. Most of the cork and lead that could be salvaged was stripped from the netting before it was placed in a huge pile and soaked with kerosene prior to burning.

As much publicity to this act was given as possible. Official movie cameras clicked during the burning and numerous photographers secured shots from every angle. It is hoped this wholesale burning of illegal fishing gear will have a salutary effect upon fishermen who have gained the idea that they can violate the law with impunity.



FIG. 70. Nine miles of illegal nets confiscated by deputies in warehouse, Vallejo, California, awaiting destruction. Photograph by Henderson Studio, April 28, 1928.

It is hoped that those interested in the perpetuation and conservation of fish and game, who witness law violations or have knowledge of such on information or belief, will immediately notify the deputy in whose district the violation occurs. Deputies can also be consulted for information regarding fishing and hunting conditions.

On April 30, nine miles of illegal fish nets valued at nearly \$20,000, were officially destroyed by the Division at Vallejo. The nets could not be used legally

Ben Cowden of Grass Valley is languishing in the Nevada County jail as a result of fishing before the opening of the trout season. He was apprehended on Squirrel Creek by deputies A. W. Sears and A. H. Willard. When brought into the court of Judge H. B. Dow, at Nevada City, he was fined \$100 or an alternative of 100 days in jail.

Another offender, J. Ballou, is serving 150 days in jail in default of an assessment of \$400 levied by Judge W. E.

Everson, of Elk Grove, for trapping and having in his possession four Chinese ring-necked pheasants. Deputies Bert Laws, William Hoppe and Paul Bonnot are to be credited with the making of the arrest.

Captain Jack O'Connell, assisted by deputies William Hoppe and Bert Laws, caught a native of Portugal, J. George, after he had killed a Chinese ring-necked pheasant on Tyler Island. The offender paid a record price for the slaughtered bird, for he was fined \$300 by Judge Everson.

If pheasants are to be successfully introduced into California they must be

alibis and change of venue failed to save Samuel Thompson and Cash Caley of San Bernardino and Jack Murphy of Los Angeles from a conviction for possession of deer meat in Game Refuge 4-A. Deputy C. J. Malone and Deputy Sheriff Brown arrested the trio in the game refuge after finding two sacks containing the hind quarters of two deer in Thompson's woodshed. The men had concealed their weapons in an automobile by covering them with canvas. As there was a foot of snow on the ground at the time, their explanation that the guns were covered to be protected from the dust, was not accepted by the deputies.



FIG. 71. Confiscated illegal nets valued at \$20,000 being burned at Vallejo, April 30, 1928. Photograph by H. C. Bryant.

protected until such time as the state decides to open the season on them.

Deputy R. L. Sinkey of Woodland arrested R. A. Fanan for killing a pheasant. A fine of \$100 was imposed by Judge R. W. Harrison of Woodland.

Possession of deer meat out of season cost H. E. Ford \$125 in the court of Judge Chester Moore of San Jose. This case was made by Deputy I. L. Koppel assisted by volunteer deputy V. W. Hensil.

Pleas of not guilty, carefully prepared

When haled into the court of Judge C. A. Johnson of Rialto, the defense claimed that two strangers had called the day before and left the sacks containing the deer meat. This shallow alibi failed to impress the court and a fine was imposed on each violator of \$500 together with a 100-day jail sentence. \$200 of each fine was suspended and the jail sentences for one year pending good behavior of the defendants.

Two residents of Humboldt County paid a price of \$5 a pound for eighty pounds of deer meat that patients in the county hospital enjoyed. Deputies Wil-

liam Kaliher and McPherson Lough arrested Harold Pavey of Rio Dell and F. G. Coffton of Arcata at Rainbow Bridge and brought them before Judge Frank E. Niskey, at Eureka. The apprehension of these illegal killers came as the result of information that they had been operating in the Monument Country, Humboldt County, where deer concentrate during the winter months. Rumors have it that these hunters had been killing yearlings, taking the back straps and hams and disposing of their illegal take on the open market. The penalty imposed by Judge Niskey was, therefore, none too severe.

Acting on reliable rumors that operators of the Triumph Mine on the South Fork of the Feather River were serving deer meat to their employees, deputies A. J. Stanley and George Thompson succeeded, on the morning of April 24, in walking into the boarding house at the mine and finding a last year's fawn being prepared for the table.

Robert Osborne pleaded guilty to the charge of killing the deer and as a consequence served thirty days in the county jail at Oroville and paid a fine of \$150. Judge H. S. Hills of Oroville, in imposing the heavy fine and jail sentence, expressed the hope that his action would discourage further practices of this sort.

H. R. Harrison maintaining a mink farm at Mill Creek Homesite has discovered to his sorrow that the overhead in operating a fur farm can not be reduced by feeding illegal deer meat to fur bearers. Found with twenty pounds of deer meat in his possession by deputies Harry Brittan and A. J. Stanley, Harrison was fined by Judge S. R. Dales of Los Molinos \$500 and sentenced to serve 125 days in jail.

Four San Franciscans were caught by Deputy F. J. McDermott on June 10, at Boulder Creek, with several packages of deer meat in their possession. Taken before Judge Younger at Santa Cruz, B. O. Alfred admitted killing the deer and was fined \$250 and given a six months' suspended jail sentence. The other three offenders were each fined \$100.

Two Sausalito "sooners" are now serving 150 days in the Marin County jail for invading the Mt. Tamalpais Game Refuge and killing a deer with a spotlight at night. The pair was apprehended by Captain Walter Sellmer and volunteer deputy Mrs. Sellmer almost before the

echo of the rifle shot that brought down their deer had died away.

Judge H. De La Montanya at San Rafael, in addition to the jail sentence of 120 days for Walter S. Stittmatter and 150 days for George Nolan, imposed a fine of \$200 on each deer slayer.

Mrs. Sellmer, single-handed, arrested five Japanese at Tomales Bay on charges of possession of undersized abalones. At first, the aliens refused to submit to arrest, but on seeing the earnestness of the woman warden changed their minds. They were arraigned before Judge Herman Rudolff at Novato and paid their fines.

Mrs. Sellmer made eight more abalone cases during the latter part of June. Patrolling the north shore of Marin County, she found Dr. F. B. Jones of Vallejo with undersized abalone in his possession. Dr. Jones, who is six feet four inches tall and weighs more than 200 pounds, demanded that his feminine accuser, who is but five feet four inches, cite him for trial in Petaluma. Mrs. Sellmer promptly informed him that she was doing the demanding in the case. A bystander mentioned that Dr. Jones was a physician of repute and someone retorted that he was arrested by the best looking game warden in the state.

Attempting to curb a bad practice, Judge Henry King of Castroville, levied a fine of \$50 on S. Gnisa of Chularin, for the possession of two doe fawns. Extensive publicity has been issued to prevent the kidnapping of fawns and it is now the determination of the Division to arrest those who insist on picking up fawns that are apparently abandoned by their mothers. Seldom is it possible for fawns taken out of the wild to be reared successfully under domestic conditions. Deputies Fred Post and Ralph Newsome apprehended Gnisa.

Deputy L. Arnold arrested three young men in April for killing a doe. Judge Fred Snyder, Jr., of Tehachapi, Kern County, fined them \$100 each.

Deputy C. E. Holladay of Morgan Hill apprehended A. Balanesi for killing a deer and Judge Chester Moore of San Jose imposed a fine of \$250.

A \$250 fine for having deer meat in possession was levied by Judge Louis J. Morris of Santa Maria, Santa Barbara County, on C. Schmidt. Arrest made by Deputy S. H. Lyons.

Possession of deer meat cost C. M. Wayne \$250. The fine was levied by Judge J. R. Anderson of Maricopa, Kern

County, and the case was made by Deputy L. R. Ainsworth.

Deputy A. D. Miner of Quincy arrested Harris Self for having deer meat in his possession after the close of the season. A fine of \$150 was imposed by Judge Clarence Taylor of Greenville, Plumas County.

Judge E. S. Robertson of Fortuna imposed a fine of \$100 on R. H. Elliott for having deer meat in his possession. The violator was brought before Judge Robertson by Deputy William Kaliher.

Two hours after information reached the San Francisco office that Tony Vargas at Half Moon Bay had killed a deer, Deputy Curtis Bundock, assisted by volunteer deputy Allan Curry, succeeded in arresting the violator at Half Moon Bay. He was fined \$100 by Judge E. McAuliff at Redwood City.

A fine of \$75 was imposed in Judge William Jones' court in Garberville, Humboldt County, on Alvin Pollock, caught on the Metole River by Deputy McPherson Lough, with deer meat in his possession. While this fine, although not so severe, is exceptional, convictions have been rare in this section of Humboldt County.

That it costs money to attempt to set nets for taking fish in the San Joaquin River is now well impressed upon Steve Belleci and Mike Orlando, Pittsburg fishermen. Apprehended by deputies Charles Bouton, Charles England and L. G. Van Vorhis, the two fishermen were brought into Judge Matthew Ward's court at Antioch, Contra Costa County, and paid a fine of \$100 each.

Possession of small mesh nets cost A. Ginis of Sherman Island \$250 as a result of his arrest by Deputy William Hoppe. The court of W. E. Everson, at Elk Grove, levied the fine.

Deputies William Armstrong and Charles England from a concealed vantage point watched Ben Newman of Santa Rosa and his agents for seventeen hours before they saw them kill five geese out of season. Judge L. A. Maynard of Napa fined Newman \$150.

Deputies Ray Ellis and Roy Taylor found Sam Gould with game fish during the closed season. Judge Horace N. Caldwell of Fowler, Fresno County, assessed a fine of \$100.

Two cases involving over the limit of game fish were made by deputies F. A.

and R. J. Bullard. Curiously enough both cases involved the arrest of four men. Judge E. C. Archer of Cutler, Tulare County, imposed a fine of \$100 for one offense and Judge Albert E. Holderman, Reedley, Fresno County, \$300 on the other.

Deputy Jack Burke secured a fine of \$300 from Judge E. I. McAuliff's court in Redwood City when he arrested A. Printon for having trout in his possession out of season.

Judge J. D. Blackwell of Newman, Stanislaus County, extracted \$125 from L. Hewson, brought before him by deputies C. L. Gourley and George Magladry for using set lines.

Below normal precipitation has resulted in rapid decrease of stream flow and brought about good fishing early in the season. Conversely a dry summer with its attendant increased fire hazard and dry stream beds will result in additional work on the part of the patrol force in rescuing stranded fish.

Soon after the water stops flowing, pools where the young trout concentrate will be found all along stream courses. Their congestion will serve as a magnet and attract a large number of snakes, birds and predatory creatures. A few large trout in the pools will aid further in the destruction of the small fry.

In saving great numbers of young trout from perishing during such times of stress, deputies frequently devote much of their zeal, their energy and their experience. In not a few cases, many of these stranded pools are filled with large boulders; some have willows and brush making the use of a dragnet well-nigh impossible. Then, too, the transportation of the fish to live water involves much hardship and patience.

Deputy J. D. Dondero of Lakeport writes as follows:

"I find that it takes three persons to do rescue work adequately. First, I locate the pools, then I get in and remove all brush and stones, making as smooth a bottom as possible. The next day when the water is running clear, with the aid of three others, I start the net at one end of the pool and work it very slowly, keeping the leadline on the bottom. I have gathered as many as fifty pounds of three-inch trout in one hauling by this method. These are poured from the net into the cans, previously filled with good, clear water, without being touched by the hands of the

rescuers. Since the temperature in the pond has become fairly warm, I find the fish much easier to handle in transportation.

"I prefer to have boys sixteen years of age than men, as such chaps seem to enjoy the work, looking upon it as a kind of adventure. In most cases, it is necessary to work early and late to get the best results and boys of this age are willing to lose sight of the passage of time.

"Last year on the lower reaches of Soda Creek, I rescued approximately 80,000 trout."

Deputy E. H. Glidden of San Diego recently performed some good work in checking the spread of carp in San Diego County. Eleven carp from nine to fourteen inches in length were taken from an old cistern where they had apparently prospered. From reliable sources, it is positively believed that this is the first instance of the appearance of live carp in the county, although it is claimed by some that carp inhabit Santa Margarita Lake. It is not known how or when these carp were introduced. However, Deputy Glidden took pains to remove all possibility of these reputed undesirable fish perpetuating their kind in any of the other lakes or streams of the county.

Department of Fish Culture

In March, 2,493,000 rainbow trout eggs were received at the Mount Shasta Hatchery from the Klamath River Auxiliary stations. 20,000 eggs were spawned from the rainbow trout in the brook ponds at the hatchery. 207,000 eyed eggs were shipped to other hatcheries for further development.

In April, further allotments totalling 980,000 rainbow trout eggs were shipped to Mount Shasta from the Klamath stations. Shipments of 1,950,000 eyed eggs during this month left a balance of 1,593,000 eggs.

In May, some 300,000 black-spotted trout eggs were received from the Mount Whitney Hatchery and an additional 963,000 rainbow trout eggs from Shackelford and Beaver creeks.

Distribution of fingerlings was well in progress by May. Car No. 01 distributed 710,000 Loch Leven and 350,000 German brown trout to several localities in the state for planting by deputies. Approximately 8,376,000 trout of different varieties remained to be distributed in June from the Mount Shasta Hatchery.

Six hundred thousand salmon fry were liberated from the Fall Creek Hatchery in March, and an additional 400,000 were turned out when high water flowed over the top of the pond in which they were being cultured. The growth of these salmon fry was so splendid that during May, 1,250,000 more were liberated. Another million in fine condition are to be planted later.

Due to the very cold water, the rainbow trout egg take at the Fall Creek Station has not equalled that of average years. Nevertheless, a sufficient number of eggs have been procured to stock the streams in the Fall Creek section.

All egg collecting stations on the Klamath River were closed by the middle of May. Shackelford proved the banner station this season and remained in operation almost as long as Beaver Creek, where a large take was also made.

Hornbrook station had a very poor season and as there was little prospect of another run of trout the racks and equipment were stored earlier than usual.

Much trouble was experienced in March at these stations due to the high water. Camp Creek overflowed the racks, and driftwood damaged the trap, but not seriously. Heavy rains caused much driftwood to come down Bogus Creek, which clogged the head of the fishway. Few fish came up the creek during the bad weather, but began to run in fair numbers as soon as the water lowered.

The total number of fish of all varieties in the Mount Whitney Hatchery in May amounted to 2,755,000.

A crew of men was dispatched the latter part of May to the Cottonwood Lakes to procure golden trout eggs. Some 1500 golden trout have so far been trapped and spawning will commence the first week of June. This will be the earliest period golden trout have been found ripe. The unusual condition of the fish is no doubt due to the mild and open winter.

The closed season on June Lake has aided the egg take materially. During the first twelve days in May, 1,155,000 steelhead eggs were obtained. Steelhead were caught in the seine every day, while last year, after the season opened, only a few fish repaid the effort expended.

Fern Creek Hatchery was opened on March 12, and the crew set about to trap fish. Some 450,000 black-spotted trout eggs were collected, and before the

end of the following month 1,320,000 black-spotted trout eggs had been forwarded to the Mount Whitney Hatchery. It was all the crew could do to spawn and care for the 2,451,000 trout eggs that remained on hand during April.

The Rush Creek trap from which most of the black-spotted eggs were collected has given very satisfactory results this season. Even during May the take in this species amounted to 505,000 eggs.

A new experiment station established on Walker River will test out the water this year and determine if conditions will warrant the location of a permanent hatchery there for Mono County.

At Fort Seward Hatchery 958,000 steelhead trout and 168,000 rainbow trout eggs have hatched and are advancing nicely.

The egg-collecting season came to a close on Prairie Creek in April. In March the new tent hatchery neared completion sufficiently to receive a portion of the eggs and by May it had some 567,000 steelhead trout fry developing in its new troughs.

At the Cold Creek Hatchery 1,200,000 steelhead fry are being developed into fingerlings for distribution in Lake, Mendocino, Napa and Sonoma counties.

Repairs were being rushed in April to take advantage of another good run of fish at the Snow Mountain Egg Collecting Station. Unfortunately, the power company opened a number of gates in the Gravelly Valley Dam, bringing the water level in Lake Pillsbury below the crest of the dam. This act occasioned stoppage of the flow of water and many fish laden with spawn coming up to the Snow Mountain Station were forced to turn back down the river. Their spawn was irrecoverably lost. Later, a like manipulation by the power company followed, and it was decided to abandon the station. The total take amounted to 2,100,000 eggs.

Over 2,000,000 rainbow, Loch Leven and eastern brook trout are developing at Clear Creek, and 585,000 rainbow trout at Domingo Springs Hatchery.

Every effort was made to obtain more rainbow eggs in Clear Creek, Domingo Springs and other adjacent stations. At Manzanita Lake, a trap was placed in the creek leading into the lake. Another was placed in the creek entering Butte Lake. Work at Clear Creek was inter-

rupted by washouts and inclement weather during the spring and only 900,000 eggs were collected.

The 1,225,000 eggs at the Yosemite Hatchery have hatched and all are in excellent condition with the exception of the oldest Loch Leven which have been the most affected by an epidemic of azalea poisoning. Medical baths and other remedies checked the epidemic and prevented any great loss.

Work on the aquarium is nearing completion. The four ample tanks will serve a real educational capacity when mature fish are swimming about in them.

The condition of the Loch Leven trout in the holding tanks improved materially as soon as the temperature of the water became warmer. The fish fed better and plans are under way for their liberation.

The Wawona Hatchery has been considerably renovated and there are now on hand 141,300 rainbow trout, 92,500 steelhead trout, and 147,800 black-spotted trout.

Water conditions in the vicinity of Bear Lake have made for difficulties in spawning this season. Two streams where traps have been used with success in the past dried up in April. With Metcalf and Grout creeks dry only North Creek was left.

Two-thirds of the eggs taken at the Bear Lake Station have come from Kidd Bay. The bay has had less than a foot of water in it, but fish somehow are attracted there and form in schools at the upper end. Large numbers have been captured with a small piece of seine.

In May, however, the water supply at Bear Lake failed and it was necessary to rush to completion the two new experimental stations in southern California to take care of the rainbow trout eggs taken from Bear Lake.

The San Gabriel Station, on the north fork of the San Gabriel River northeast of Azusa, was completed in time to receive 500,000 of the Bear Lake rainbow trout eggs.

Forsee Creek Station near Seven Oaks in San Bernardino County was ready to receive eggs early in June.

Construction of holding tanks to be located at Coldbrook Camp on the San Gabriel River and Forsee Creek commenced in June. It is hoped that these holding tanks will lessen difficulties and relieve the unfortunate conditions at Bear Lake, as well as produce a larger fish for planting.

It will be necessary to make early distribution of the 1,125,000 fry in the Feather River Hatchery. The water in Tamarack Creek is falling rapidly.

Loch Leven and eastern brook trout in the Kern River Hatchery are evidencing signs of disease. The Loch Leven have responded to treatment; the eastern brook have so far shown little signs of improvement. The cause may be due to the large amount of water mould and algae in the water. The biologist of the department is making a careful study to determine whether the water is suitable for the establishment of a permanent hatchery.

Rainbow trout eggs numbering about 100,000, and a like number of steelhead eggs have hatched.

The 922,000 fry at Big Creek Hatchery are reported to be in first class condition. 576,600 steelhead eggs were shipped from the hatchery in April and 996,000 eggs collected. In May, 263,000 steelhead eggs were taken. Some were sent to Sonora.

Plans are being made to operate the Brookdale Hatchery as an experimental place where pathogenic conditions of both fish and eggs can be studied. The hatchery is also to serve its former function in hatching and distributing a supply of fish for local streams.

Six new tanks, four feet wide, sixteen feet long and thirty-two inches deep, have been built at the Mormon Creek Hatchery to care for the 795,000 fish that are developing rapidly and range in size from four inches down to almost the sac stage. The new tanks are sheltered in a large shed strongly built and capable of withstanding the snows of winter.

An investigation shows that the fish planted last year in the waters of this vicinity are lively and vigorous. Conditions in the stream at present are ideal for planting and some of the trout now being developed will soon be liberated.

The new Kaweah Hatchery is nearing completion and will be occupied shortly. Meanwhile, the old tent has been doing its best to serve the purpose of a hatchery. The steelhead and rainbow eggs are hatched and the resulting fish have been feeding since the early part of May.

It has been necessary to build eight new troughs to hold the 100,000 black-spotted trout eggs now being developed in the Kings River Hatchery. There are

also 100,000 rainbow trout eggs developing at this station.

The water supply at the Lake Tahoe Hatchery is becoming serious. The snow is about gone and the streams are low. It will be necessary to transfer some of the 1,390,000 fry now on hand if water conditions become more alarming.

An early distribution will also be made from the Mt. Tallac Hatchery to relieve the congestion caused by low water. The hatchery has been filled to capacity since May.

A biological study has been made of the condition of steelhead eggs collected at Scott Creek, Santa Cruz County. Examination of the eggs just previous to hatching showed abnormal oil globules in the yolk which brought about changes resulting in the death of the embryo and the entire egg being covered with a heavy fungus growth.

The condition of the water supply at the Yosemite Hatchery was also investigated, as well as that at the Kern Hatchery. The water coming into the Kern Hatchery was found to contain great quantities of blue-green algae, causing a heavy growth on the sides of the tank within twenty-four hours after they had been thoroughly cleaned. The fry were found to be suffering from a heavy infestation of the gills by peculiar desmid (*Auhistrodesmus*) which is tinier than the point of the finest cambric needle. This penetrates the gills causing an irritation followed by bacterial infection which is very rapid in its growth due to the weakened condition of the fish, and soon causes death by suffocation.

Department of Commercial Fisheries

The patrol boat *Albacore* was sent to Ventura on March 14th to search for bodies washed out to sea by the St. Francis dam disaster. The crew found the waters of that section of the coast very muddy, and encountered drift-wood, shrubs and trees, lemons and oranges floating around within one to three miles offshore, but found no bodies. The search was continued until the 22d, when the *Albacore* returned to Terminal Island.

Later in the following month, the *Albacore* left for Eureka where the coast was patrolled against violators having salmon in possession in a closed district.

During July, the boat was used in assisting Dr. Henry B. Bigelow of Har-

vard University, who is carrying on investigations of the currents, temperature and salinity of the water and the distribution of plankton in Monterey Bay. The information obtained in this work will be of use to the division as it may lead to an explanation of the abundance of the sardine.

Deputy Ross W. Markley at Pismo Beach has been energetic in surpressing violations of the law respecting Pismo clams. A recent arrest of Frank Bisell for having over the limit of these famous clams was made on March 21, and Judge William Mallagh of San Luis Obispo, gave the offender thirty days in jail.

The month of May was a busy one for the patrol force at all points. L. G. Van Vorhis of Pittsburg checked boats for registration and fishermen for licenses at Pittsburg during the height of the shad run.

Ralph Classic and N. M. Matthews were busy with the salmon fleet and trawlers on Monterey Bay.

Deputy Markley, at Pismo, had a very active month with vacationists and professional clam diggers and abalone hunters along the San Luis Obispo coast.

In the San Pedro district, C. H. Groat, Tate Miller and N. C. Kunkel were busy night and day thwarting attempts of barracuda bootleggers after the closing of the purse seine and lampara season.

At San Diego, Captain Coburn Maddox was kept occupied checking boats for registration and fishing licenses, as well as checking allotments of fish coming into California from Mexico.

The chief field work of the laboratory has involved the sampling of the commercial catch of sardines at the three fishing centers. The abalone catch is also being sampled and the barracuda catch observed. Minor observations are made on the catch of various species of freshwater fishes in the fish markets. Occasionally, members of the staff do seining to collect material for research purposes.

Mr. Paul Bonnot is continuing his work on the sea lions. With the use of the patrol boat *Albacore* he will make a survey and census of the sea lions along the coast from Oregon to Mexico. The purpose of the census is to keep an accurate record of the number of sea lions and to have available complete data on the rate of increase of the herds. Many people advocate indiscriminate slaughter of the sea lions, but this is

not the policy of the Fish and Game Commission. If the herds are increasing too rapidly and are becoming a menace to the fish in some localities and it becomes necessary to reduce the herds, it should be done in a humane and scientific manner under the supervision and control of the Fish and Game Commission.

The following circular was sent to all dealers in Oregon and California, under date of May 31, on the subject of "Fish Tags":

"The Division of Fish and Game will discontinue use of the hexagonal-shaped fish tags for tagging Chinook salmon which may be held or sold during the closed season, or shipped in during the closed season, and steelhead which may be shipped in from Oregon and Washington at any time. This form of tag will be used only for tagging domesticated trout at trout farms situated in California, or domesticated trout which may be shipped into California from other states.

"All dealers who are holding any of the hexagonal-shaped tags should return them to the Division of Fish and Game, San Francisco, on or before July 1st, unless they are holding them for use in tagging domesticated trout to be shipped into California.

"For use in tagging salmon and steelhead, a new oval-headed, spear-shaped tag will be put into use on July 1, and complete instructions for handling same will be furnished with the tags."

Bureau of Education

An invitation was extended to the bureau to furnish a series of broadcasting over the Pacific coast network in connection with a half-hour program conducted as the "Philco Campfire." The first two Thursday nights in May were utilized by Dr. H. C. Bryant in a discussion of candidates for the state bird. Subsequent subjects dealt with the sea otter, celebrated fur-bearer of the state, and other suitable campfire topics.

The first of a series of portable exhibits has been completed. It shows mountain sheep in their desert home. The coloring and installation was done by Mr. E. S. Cheney. A fine ram stands in the foreground and a small band are seen in the distance about a waterhole. Still another sheep animated by an electric motor, is seen to leap down a steep cliff. This exhibit was initially displayed in the Ferry Building, San Francisco.

Two new reels of motion pictures are being assembled. One will show various activities of the Division of Fish and Game: law enforcement, fish propagation, game bird propagation, education; the other will be a conservation picture emphasizing depletion and the real need for conserving a breeding stock sufficient to furnish good sport.

The new feature reels showing fish propagation and fish distribution are meeting with popular favor and are in almost constant use.

Those seeking knowledge on fish and game and natural history subjects will find they can make good use of the excellent library, under the supervision of Mrs. Bessie W. Kibbe, a trained natural history librarian, maintained at San Francisco, at the headquarters of the Division.

Altogether some 475 volumes and 6000 pamphlets are now available. Special attention is given to the official publications of the fish and game departments of other states. The laws of all the states and territories, as well as those of Canadian provinces are on file. These are often consulted. Books on birds, fish, mammals, crustaceans, oceanography, nature study, reptiles, insects, zoology and biology and five natural history sets make up the scientific section, while authentic works on fur farming, game bird farming, fishing and other fish and game subjects are included in the extensive reference list.

Numerous letters requesting information are daily received, bearing on fish ponds, identification of fishes, seasons, how to grow them and their acclimatization and diseases; identification of birds, their economic value, their migrations, songs, houses, eggs and life history; game bird farming; fur farming and alligator farming; hunting, deer, mountain lions, squirrels and trapping of muskrats and other animals.

Books are loaned only to employees of the division, but the library is open to the public and their visits are solicited for reference work.

Additional investigations of the reputed damage committed by small birds to rice and fruit buds has been carried on in the Oroville section. A study was also made in the Richvale district in Butte County on the damage done by tri-colored blackbirds to recently sowed rice.

Several studies on the effects of thallium poisoning have been made. A serious condition developed near Stockton where

thallium poisoning was spread and a number of vertebrate animals destroyed. The effect of thallium poisoning on quail on the western slope of Mount Diablo was also looked into.

The demand for lectures illustrated by motion pictures has increased to a point where careful planning is necessary. Sections of the state are now intensively covered after a lecture itinerary has been previously arranged. Care is taken to give all sections of the state equal attention. This program further emphasizes the serious attempt to make fish and game laws more popular in places where law enforcement is difficult.

Efforts to introduce a program of nature study and conservation in the public schools have met with a success almost beyond expectation. Mrs. O. P. Brownlow, to whom no small measure of credit is due for this work, has by her zeal, aroused a deep interest in the San Francisco and Oakland public schools in the study of living things.

Bureau of Research

Stockmen and others have complained that predatory animal control carried on by agencies in areas surrounding game refuges has been hampered because the predatory species migrate into the refuges where they are harbored in safety until the fury of the campaign of extermination subsides.

Two predatory animal trappers were employed in April to work in game refuges and ascertain the validity of these complaints. A thorough examination of the Mount Diablo Refuge (3-F), was made, but not sufficient signs of predatory animals were discovered to justify any considerable amount of work. Hence, the trapper was transferred to the Mount Hamilton Refuge (3-E), where he has, in cooperation with the other trapper, made a careful study of conditions. Only five coyotes, and a like number of wildcats, were trapped in April. On the whole, the survey has shown that great numbers of predatory animals were not present in the refuge.

This work is being conducted in cooperation with the State Department of Agriculture and the United States Biological Survey.

To forestall a recurrence of mussel poisoning which caused much consternation last year, considerable research has

been conducted by Dr. K. F. Meyer of the Hooper Foundation for Medical Research. Mussels are now being tested for toxicity and the Bureau is assisting in procuring samples of mussels for Dr. Meyer's researches. Dr. Meyer will issue statements through the newspapers if the toxicity reaches a degree where poisoning would result from the use of mussels.

The parasitologist of the Bureau is conducting an investigation on quail diseases and is making a careful study of blood parasites affecting quail. Possibility of insect transmission of parasites of game birds is being experimented with also. No blood parasites originating from this source have yet been discovered in any wild bird other than quail.

Some duck sickness is still present at Buena Vista Lake. Much material has been collected and prepared for study. An extensive examination into the possible sources of the duck sickness to the end of correcting the Buena Vista Lake situation has been set on foot.

Most of the ducks treated at the "duck hospital" have recovered, been banded and liberated.

Bureau of Public Relations

Routine work of the bureau during the past quarterly period included the preparation of sixty-four stories for publication in more than 400 newspapers on the Division publicity list.

In addition to this, a special story has been prepared weekly for the National Automobile Club bulletin which reaches over 800 newspapers. These stories do not in any way conflict with the regular news releases.

A trip during the month of April covered the southern part of the San Joaquin Valley. Talks were made at Bakersfield and Hanford and calls made on organizations and newspaper publishers at the places mentioned as well as at Visalia, Tulare, Fresno, Madera and Los Banos.

Numerous good cases made by field deputies have furnished copy for several news stories that have been given general publication, while two general stories sent out, one on the opening of the trout season and another on the closing of streams in different parts of the state, were published in practically all of the papers on the list.

A special feature story on the "Planting of Golden Trout in Barren Waters of California" has been prepared and is being made ready for publication.

Records show that interest in fish and game matters is growing, as more and more newspapers are not only using the division publicity releases, but are developing special stories of their own.

Bureau of Hydraulics

Many fish ladders neglected and needing repairs are now working and fish are passing up them to spawn. Reports recently made by deputies supplied information concerning the ill state of these ladders, and steps were quickly taken by the bureau to cause their repair.

A few dams no longer serving a useful function were also reported on and arrangements are being made to have them blown out.

The reports show that screens were inspected and were in condition for use when water will be diverted this season.

A fish ladder has been completed by the Donner Lake Company at the outlet of Donner Lake, Nevada County, in compliance with plans furnished.

Reports show that fish are ascending San Anselmo Creek, Marin County, and that some are seen at places where, during the past seven or eight years, none have been noticed. This satisfaction comes as the result of the installation of a fish ladder by the Emporium Country Club and Cascade Estates Company.

On an inspection of the Fort Bragg vicinity, Mendocino County, it was found that three recently constructed fish ladders were being used by salmon and steelhead.

Other inspections made include the fish screen operated by the Anderson-Cottonwood District, Shasta County; the screen of the Hallwood Irrigation District, Yuba County; and a number located in Tehama County. The Elk Lumber Company's fish ladder on the Elk River, Humboldt County, was examined and that of the Yuba River near Marysville, Yuba County, recently damaged by flood. Arrangements were entered into for the construction of fish ladders on the Enos Dam and the Gibson Dam, Trinity County.

The Union Oil Company has cleaned San Luis Obispo Creek and removed all evidences of pollution. An oil tank fire

caused large amounts of oil to flow into the creek and the company made a considerable outlay in cleaning up the damage done.

The company is satisfactorily keeping the beach clean at Avila, San Luis Obispo County, and employing men from time to time to scrape up and burn deposits of oil swept out to sea and returned to shore by the tides.

The Rincon oil field north of Ventura has been maintained in a most creditable manner. Inspection of the operations there disclosed no cases of pollution. Drilling crews have been warned by the operators that permitting oil to escape is a serious offense, subject to severe censure and even discharge.

The Signal Hill oil field at Long Beach was inspected. A material improvement in the condition of the field has resulted from certain changes recently made in what is known as the "frog pond." A new channel to take care of storm waters was cut so as to leave the old channel useful as a pond to receive oil and mud.

The Shell Oil Company has just finished the installation of a system of sumps at Bicknell in the Orcutt oil field. It is anticipated that the system will handle 2000 barrels of waste oil daily, returning the water to the natural drainage clear and free from oil.

The Rice Ranch Oil Company have recently installed a system of tanks and sumps at the scene of their operation near Orcutt. This has also been done to prevent pollution.

Probably one of the most impressive manifestations that powerful companies have given lately of their desire to put an end to pollution and remedy unfortunate situations where they have occurred, is the large sums of money being expended.

The Oil Operators, Inc., operating Signal Hill, Long Beach, for instance, have spent over \$215,000. Cleaning the oil from the flood control channel cost them about \$1,500. A sump of about 225,000-barrel capacity represented another goodly outlay and work is now going forward on the construction of further sumps to provide amply for future demands exerted on the field.

The Texas Company of California may be cited as another example. The corporation plans to install an oil separating system at Watts, Los Angeles County, which will cost from \$60,000 to \$80,000.

The same company will have another separator in operation in the San Pedro field, and intends to expend around \$70,000.

The Associated Oil Company has joined the ranks of those who are taking definite steps to prevent pollution. They have fitted the *S. S. Whittier* with a reclaiming device. This has proved so satisfactory that by a recent order all vessels owned and operated by the Associated Oil are to be similarly equipped.

Blow lines have been installed by the Richfield Oil Company as the result of an inspection of a wharf jointly owned by the Richfield, General Petroleum and California Petroleum oil companies at Parr Terminal, Oakland. Further work will be carried on by the other two companies.

The gas plant at Vallejo, Napa County, operated by the Pacific Gas and Electric Company, has discharged waste products for many years on the bay flats. The situation has been further aggravated by deposits of refuse from oil tanks. An investigation proved the need of a clean-up campaign. This is now in progress and measures have been taken for permanent relief.

The Pacific American Petroleum Company has filled in a sump and corrected other sources and means of pollution. The sump in question was located in the natural drainage and greatly aided in aggravating the pollution problem of the Huntington Beach field.

The Orange County Refining Company at Newport, Orange County, has mopped up escaped oil resulting from a fire. Some of this oil reached the bay, and this, too, has been removed.

Court action against the Pacific Coast Oil Company and four individuals operating at Huntington Beach, Los Angeles County, has been dismissed since unfavorable conditions complained of have been rectified.

Under the stress of storms, sumps have been in the past accustomed to breaking and letting the oil they contained pollute the area round about. Peculiarly enough, sumps located in other than the Huntington Beach field have not acquired this habit. The obvious conclusion is that the operators in the Huntington Oil district have been availing of storms as an excuse to empty their sumps.

Persistent patrolling during recent storms by Deputy E. A. Chan thwarted this pernicious practice.

A common illustration that pollution may cause trouble in the future is offered when oil saturated ground oozes during warm weather. A rarer instance of this resulted in May when the Wilshire Oil Company, at Huntington Beach, liberated quantities of hot water into a ditch. The hot water coming into contact with the oil soaked ground soon acquired a film of oil colors and these found their way into the natural drainage.

It is still necessary to resort to legal action.

\$450 of the fine, however, but with the injunction that the balance automatically become payable upon proof of any future pollution.

Pollution of the Ventura River by allowing waste oil to flow into that stream cost the General Petroleum Corporation, operating in the Ventura field, a fine of \$200 in the court of Judge Edward Henderson at Ventura.

This company was hailed into court less than a year ago and a fine of \$500 was suspended. However, in the present case, the judge insisted that the fine be paid. Deputy R. E. Bedwell made the arrest.

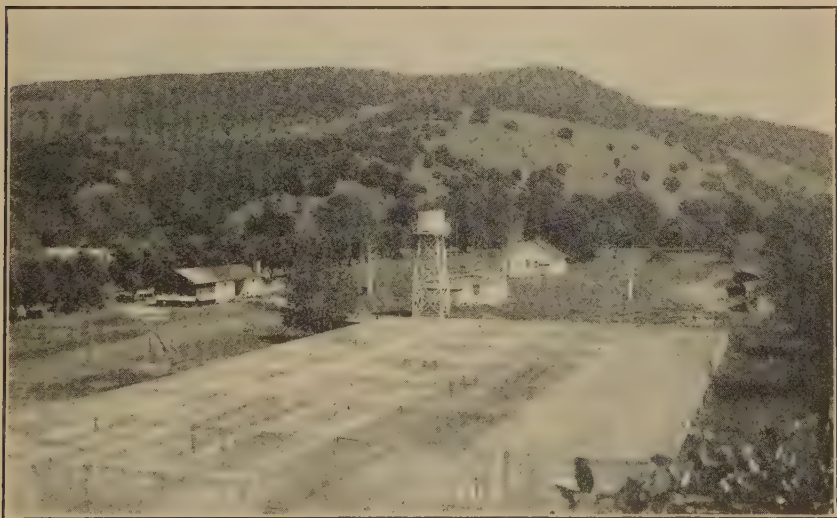


FIG. 72. Original breeding pens built in 1926 for Chinese ring-necked pheasants transformed into quail section at Yountville Game Farm. Here quail experiments are being carried on. Photograph by Milton Clarke, April 20, 1928.

On March 24, Deputy E. A. Chan filed a criminal action against P. C. Hofmann, superintendent of the Pan Pacific Refinery, for discharging oil into Long Beach harbor. Following the trial of April 26, Judge Charles D. Wallace fined the violator \$500 or an alternative of 250 days in jail. Four hundred and seventy-five dollars of the fine was suspended for two years in the event the refinery committed no further violations.

The superintendent of Featherstone and Preston, Inc., was charged on April 23, for liberating an oil filled sump into the natural drainage. On plea of guilty, he was fined \$500 in the municipal court at Long Beach with an alternative of 100 days in jail. Judge Wallace suspended

Bureau of Game Farms

The first of June found the Chinese ring-necked pheasants well advanced in egg output for the season. Exactly 6776 eggs were on hand in various stages, from those but recently collected and waiting to be set, to eggs just about to hatch. During the month 4203 chicks hatched.

During May a total of 3342 Chinese ring-necked pheasant eggs were hatched. Some of these chicks came from 5392 eggs set in April under domestic hens and in incubators. The pheasant hens commenced to lay in earnest in April and two weeks afterwards the attendants on

the farm were playing the "shell" game with thorough familiarity.

The wild turkeys from Arizona were the first to reproduce and more than a hundred eggs were laid by the hens in March. The first twenty-two eggs set yielded twenty chicks on the last day of March. One egg was broken in incubation, the other proved infertile.

The hens continued laying in April and May. A total of 186 young turkeys are now in the rearing pens and 116 eggs are incubating. Thus, a problem is presented of finding room as soon as the birds attain the age when they should be ranged. A field for this purpose is now being arranged.

The first crested tinamou, a game bird of South America, hatched on April 26. The tinamou is a stranger to California and there was no certainty that the brood stock on the farm would reproduce. Both male and female are exactly alike. Hence, this occurrence was a pleasant surprise.

Before the end of the month following, five additional olive green eggs were laid. The eggs were fertile but from some unknown cause the young all died in the shell three or four days prior to the hatching time and only one bird hatched.

The second and smaller variety of tinamou laid two eggs during the first week of May. These are a beet red color and elicit comment from visitors as they seem especially prepared Easter eggs.

By the end of May the third variety of tinamou had reproduced, bringing the total number of eggs incubating to 13. The last five hatched are being anxiously cared for and fed grasshoppers and other prized insects.

Forty Hungarian partridges were released in a sanctuary established in Squaw Valley near Fresno on March 26. These birds represented the remainder of the flock and seemed averse to mate while in the pens. It was deemed best to liberate them while it was yet possible for them to mate.

During the week of May 13, the first Hungarian partridge egg was picked up

in one of the breeding pens. The birds then started to lay in a limited way. Before the end of the month fifteen eggs had been laid. These are now being incubated.

Latest reports from Squaw Valley are that the Hungarian partridges have remained within a mile of the place of liberation. No loss so far has been discovered and it is expected that the birds will multiply.

The large white swan presented to the Game Farm last year after the Sportsmen's Show in San Francisco, decided that the climate was not to his liking, possibly because he was all alone, and left for the northland. The swan was kept with some geese and mallards at the Napa State Farm, a half mile from the Game Farm where the use of an open pond of water is available.

An added attraction for visitors is a pair of native grey tree squirrels. The attendants caught this pair near the farm. They had been watching the nest and waiting until the young squirrels were big enough to be right for pets.

A very fine cage has been constructed around one of the olive trees and in a month or so the little animals will be real pets. They now sit up in regular squirrel pose, taking a piece of nut between their paws and eating it with relish.

An incubator room was added in April to the side of the building where food for the birds on the farm is prepared. The three additional electric incubating machines will give the room an incubating capacity of 2500 eggs. The room was built with special regard to coolness and ventilation.

Faithful to a promise made last winter, 360 Chinese ring-necked pheasant eggs were shipped to the Territory of Hawaii during the last week of April.

An even trade of Chinese ring-necked pheasant eggs for Hungarian partridge eggs has been arranged with Ralph Baird of Brooks, Alberta, Canada. Early in May 100 ring-necked eggs were shipped.

COMMERCIAL FISHERY NOTES

N. B. SCOFIELD, Editor

RECORD CATCH RECORDED

Owing to the great mass of figures that must be gathered to compile the annual catch of fish in California waters, the report for 1927 has just been completed and will be published soon, together with a report of the fish pack for the year, and a report of the sardine canning industry for the season of 1927-28.

Not only leading the United States but establishing a record for California, the fishermen of this state turned in a banner catch during the year of 1927, when a total of 424,367,182 pounds was produced, having an estimated value of almost \$30,000,000. Sardines, as usual, lead with a poundage of 342,275,289, while sole was second with 10,298,268 pounds. The smallest item in the report was five pounds of eels taken in the San Francisco-San Mateo district.

Other species reported were: salmon 6,511,929 pounds; rockfish 6,369,323 pounds; skipjack 5,803,649 pounds; bluefin tuna 4,898,386 pounds; mackerel 4,728,903 pounds; albacore 4,455,372 pounds; barracuda 4,355,583 pounds; buck shad 1,986,295 pounds; roe shad 1,980,546 pounds; yellowtail 1,435,456 pounds; halibut 1,387,178 pounds and herring 1,168,321 pounds.

In the shellfish group, crabs totaled 123,346 dozen; spiny lobsters 508,123 pounds; abalones 2,816,530 pounds; shrimps 1,697,365 pounds; cockle clams 5,914 pounds; mixed clams 59,076 pounds; Pismo clams 133,000 pounds; soft-shell clams 151,383 pounds and squid 6,014,113 pounds.

Monterey County led the state in fish production with a total of 185,775,478 pounds; Los Angeles was second with 169,995,637 pounds; San Francisco-San Mateo third with 37,616,402 pounds; San Diego-Imperial fourth with 13,362,571 pounds. Other districts rank in the following order: Alameda-Contra Costa 3,973,963 pounds; Del Norte-Humboldt 3,367,575 pounds; Santa Cruz 2,768,088 pounds; Mendocino-Sonoma-Lake 2,033,440 pounds; Marin 1,727,254 pounds; Sacramento-San Joaquin 1,007,631 pounds; San Luis Obispo-Santa Barbara-Ventura 1,007,482 pounds; Solano-Yolo 987,141 pounds; Orange 744,520 pounds.

In addition to the California catch, records of fishermen and packers showed that 62,132,490 pounds of fish were brought in from Mexican and extra-terri-

torial waters off the coast of Mexico during the year by California fishermen. The largest item in this list was 28,003,362 pounds of skipjack. Barracuda totaling 1,844,156 pounds and white sea bass totaling 1,466,848 pounds came in from waters south of the California-Mexico boundary.

GRUNION AND SMELT

Many fishermen who are interested in catching surf smelt along northern California beaches have been confused by the law which was passed at the last session of the legislature, protecting the grunion in southern California during the spawning season, from April 1 to June 30. Although the fish are similar in appearance, the grunion is not a smelt, while the northern California fish is a true smelt. Smelt are peculiar to the beaches of northern California, but the grunion is found only south of Point Conception. The spawning habits of the two fish are entirely different, the smelt spawning outside the beach line where gravel is found, while the female grunion deposits her eggs several inches below the surface of the sand and far above the level of the average tide.

ALBACORE

Two shipments of imported albacore were recently received at Wilmington. One consignment of a little more than a ton arriving on June 2, was sent from Honolulu, and the second lot, which came on June 4 from Japan, amounted to twenty-six tons. Reports show that several shipments of this species have been sent from Japan to the Los Angeles harbor during the last year. The albacore in these two shipments were much larger than those that are caught off the shores of California. Forty-seven pounds was the average weight of the fifty albacore making up the consignment from Honolulu. The largest local albacore that the writer saw during the regular sampling season of 1927 were in a catch of twenty-nine that was delivered at Long Beach; these averaged forty-one pounds. The fact that the Hawaiian albacore were devoid of heads when weighed and that the local specimens were not, makes the difference more pronounced. Another item of interest is that roe was found in a number of the females in the Hawaiian consignment.

—L. E. Herz.

WHY CALIFORNIA SARDINES ARE CAUGHT AT NIGHT RATHER THAN BY DAY

In California, sardine fishing, the most important in the state, is carried on at night for two good reasons.

First, the schools of sardines are more easily located at night on account of the phosphorescent light or glow in the water. This light is caused by microscopic organisms which are to be found in myriads in the sea water. These organisms when disturbed have the power to give out light of the same nature as glow worms or fire-flies. Fish swimming about in the water at night cause these organisms to glow, and when the fish are in compact schools the light thus caused can be seen for a considerable distance by the lookout in the fishing boat, if the night is dark.

Second, most of our sardines are caught with a lampara net which is specially designed to take advantage of this phenomenon of "phosphorescence." When a school of sardines is located, the net is laid out around it and the two ends then hauled into the boat, the circle becoming narrower until finally the sardines are confined in the "bunt" or pocket of the net, when they may be transferred to the boat with small dip nets. If all of the meshes of the net were so small that a sardine could not get through, it would be difficult to pull because of the resistance of the water. The ends or wings of the lampara nets have meshes as large as 20 inches, which the sardines could easily pass through if it were not for the fact that the phosphorescent fire caused by the net passing through the water frightens the fish away from it and into the center of the circle, until the small-meshed center or "bunt" is around and under them. Such a net can be operated faster and with fewer men than a net of similar dimensions with all small mesh. To be effective, however, the sardine net must be used at night.—N. B. Scofield.

MACKEREL CANNING

In past years small quantities of mackerel have been salted and smoked in California, and there is a steady demand for moderate amounts in the fresh fish markets of the state. There have also been several trials at canning mackerel, but there has never been the wholesale utilization of this resource such as we find in the sardine and tunas. During this last

spring several canneries packed mackerel as a small side line. One plant at San Diego cut the fish into three or four pieces and packed it in one pound salmon cans. One or two canneries in the Los Angeles Harbor region packed mackerel during the early spring months, and three canneries at Monterey canned small amounts of mackerel. Most of this canned product is in round cans, usually the one pound tall, but a little has been packed in six ounce tall cans.—W. L. Scofield.

FISHING OFF SOUTHERN BEACHES GROWING IN POPULARITY

From a small beginning in 1921, there has developed a large industry which caters to the angler fishing for sport in ocean waters along the southern California coast. At the present time, there are at least fifteen barges resorted to by anglers who enjoy ocean fishing lying off Santa Monica, Ocean Park, Del Rey, Hermosa and Redondo beaches, also Long Beach and Newport. Seaworthy launches ply back and forth between the principal piers furnishing transportation to and from the barges. Fishing tackle and bait are furnished from \$1.50 to \$2 per day and a conservative estimate of the number of fishermen is placed at 200 during Saturdays, Sundays and holidays for each barge. On week ends there are as many as fifty fishermen.

Aside from the barges, there are twenty to thirty pleasure fishing boats large enough to accommodate some sixty-five persons each. Trolling is largely practiced by these pleasure fishing parties and it is believed that at least fifty persons engage in this pastime during holidays and about twenty-five at other times. The variety of fish caught consists mostly of mackerel, halibut, rock bass, barracuda and an occasional jewfish or black sea bass.

The piers also have their full quota of fishermen. An average of at least 200 each daily, while on Saturday and Sunday as many as eight or nine hundred, are to be seen along the ends and sides, busily engaged in trying to keep their lines free from those of their neighbors. Mackerel and halibut are mostly caught, but not the amount that is taken offshore.

Besides the deep sea fishermen, a great many find pleasure in fishing for corbina in the surf. Santa Monica Canyon, north of the Nalibu, is one of the favored beaches for this sport.—R. J. Sadler, Venice.

LIFE HISTORY NOTES

HUMBOLDT COUNTY ELK

The surviving bands of Roosevelt elk, happily, are doing well in the great redwoods of northwestern Humboldt County. Indeed, it is very reassuring to know that these noble animals have not only maintained themselves in the southern limits of their present range, but are reported to have "made a very apparent increase in the last few years."

John W. Davison of Orick states that they now range in small bands as far south as Little River and as far north and east in Humboldt County as the

in a narrow strip of land three miles wide and ten long, lying west of Prairie Creek. This area, he claims, will sustain at most but two hundred elk. It is now overstocked and during winter the elk are so hard-pressed for food that they become an annoyance to farmers. In fact, not a small number have acquired the habit during the summer time of coming into hay fields at night and committing depredations.

SCREECH OWL VS. FLICKER

Four holes were drilled by flickers through the boards of a redwood tank



FIG. 73. Young elk in hay field near ranch of John W. Davison, Orick, Humboldt County, California. Photograph by J. W. Davison, summer, 1927.

Klamath River. "Elk sign" is not so scarce as it was ten years ago and almost every herd observed contains young elk. He estimates that there are between 350 and 500 in the county. An accurate count is impossible, for the larger herds remain in the denser forests where the undergrowth is tremendous and are very seldom seen. Smaller and more venturesome bands frequent the open country. Hence, an observer who only obtained glimpses of these small herds would be inclined to underestimate the number of elk in the country.

Deputy Earl P. Barnes is of the opinion that the greater majority of elk range

house belonging to Mr. E. L. Bickford of Napa, California, in an effort to make nesting sites. Boxes were placed back of these holes and the birds ceased boring and began nesting. They used the holes for a number of years.

Two or three years ago a screech owl was found in one of the boxes with what was left of one of the flickers; namely, his wing feathers. Feathers of other song birds were also found in the box. The screech owls were taken as pets and in due time other flickers took up their abode in the boxes.

In the spring of 1928 the flickers again disappeared and on investigation one of

the holes was found to contain a screech owl's nest with the young just hatched.

It seems that the flickers and screech owls both favor this nesting site, but are unable to get along congenially even when using separate nest holes.—D. D. McLean, Berkeley, California.

WHITE-WINGED DOVE IN THE IMPERIAL VALLEY

The white-winged dove from Mexico commenced its flight up the Colorado River as the nesting time for the species drew near. Usually the birds start to nest the latter part of April, while stragglers and late comers prolong the nesting period sometimes for several months. They build their nests of small twigs in the willows and mesquite trees. In these they lay two white eggs. Some large mesquite trees have as many as twelve or more nests ranging from four to sixteen feet from the ground.

Their nesting habits somewhat resemble those of the band-tailed pigeon, in that they nest in colonies and go in large bands to feed. Their feed consists of various kinds of berries, grain and small seeds. After the nesting season is over, late in the fall, they return with their young to their wintering quarters in Mexico.

The white-winged dove is a little larger than the mourning dove, and while in flight shows a white crescent on each wing and a white border at the end of the tail. Further, the tail is much shorter than that of the mourning dove. The former bird has a very dark bill and reddish feet.

A story was told me by an old Mexican that there were countless thousands of these birds in Sonora, Mexico, and that they call them Sonora pigeon. He said these birds winter there and start to come north the latter part of March, flying north until they reach the Gulf of California and thence to the Colorado River and on up the river, coming into California near Yuma, Arizona. The white-winged dove rarely goes north of Needles, San Bernardino County, nor does the bird range very far west of the Colorado River. Sometimes a few drift into Imperial Valley.—E. D. Ricketts, Brawley, California.

CANADA GEESE NEST ON HONEY LAKE

I went down into Honey Lake Valley, Lassen County, on March 22, and after tramping around in the marsh for three or four hours found two nests of the Canada goose. One nest had five eggs in it and the other six. Both birds were setting and most likely had been for two or three

weeks. We also found a nest that had not been completed. This shows that the local birds and the ones that come in from below do not nest at the same time here. We raised some mallards and they are evidently nesting too. The Canada goose usually nests in the heavy tules where there is running water near at hand. The nest is generally about two feet off the ground and sometimes in very plain sight. It is not unusual for Canada geese to nest on top of hay stacks and several nests have been located at Lake Almanor on the top of broken-off snags of large trees sometimes forty feet above the water. I have often wondered how the old bird got the young ones to water after they reached the age to leave the nests thus located.

On the 19th of April, 1927, I found the nest of a Canada goose in the tule section of Honey Lake. The young birds were hardly dry when I found them. This was evidently not an early hatching for there were young goslings about on the marsh at that time large enough to run around.—C. O. Fisher, Susanville, California.

A TICK-INFESTED DEER

The mule deer of the Sierras are prey to many insect pests, not least among them being the western dog tick. In fact, this species could be more appropriately named deer tick. Whether or not these pests cause much physical suffering and actually inflict considerable injury, is at present an open question.

In January of the present year a young buck was found dead near the foot of the Coulterville road. The body was literally infested with ticks, hundreds of them along the neck and the insides of the flanks. There were solid rows of the gorged females and the body swarmed with the younger undeveloped individuals.

There was no evidence that this spike horn had met death by accident, nor did it appear to have been affected by any disease. Except for a slight deficiency in weight, the body appeared to be that of a reasonably healthy animal—that is, exclusive of the ticks.

The western dog tick is the commonest variety on the Pacific coast. Dogs, sheep, cattle, horses, deer and ground squirrels are subject to infestation, and man is frequently enough the unwilling host. But deer are the greatest sufferers, ticks abounding, as they do, on ceanothus and others of their chaparral food plants. The female ticks are reddish brown with white markings. Their oval bodies average around 10-12 millimeters in length when gorged.

Though the buck looked as though it might actually have died of ticks, the theory is hardly tenable, according to most biologists. Nevertheless, it is true that unhealthy individuals being unable to rid themselves of these tenacious ecto-

A STRIPER STRANGLES

On April 8, 1928, near the mouth of the Tuolumne River on the San Joaquin, a large dead fish was reported which turned out to be a giant striped bass, weighing approximately forty-four



FIG. 74. Striped bass strangled by thirteen-inch carp. Found near mouth of Tuolumne River, April 8, 1928. Photograph by Perc C. Meakin.

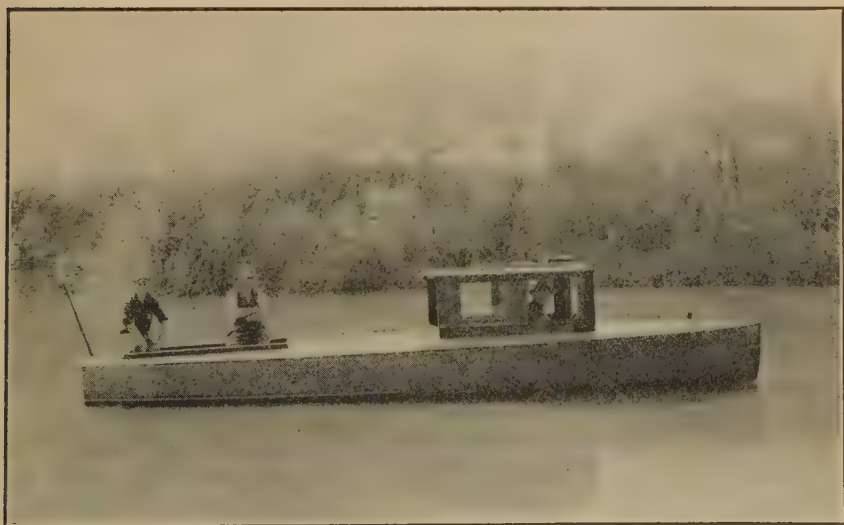


FIG. 75. New bay and river patrol boat *Rainbow*. Photograph by John O'Connell.

parasites, are heavily parasitized and may thus suffer an accentuation of their already weakened condition.—George M. Wright, *Yosemite Nature Notes*, Vol. 7, No. 5, p. 38.

pounds, and forty-seven inches in length. The fish had been dead about three days when discovered.

This striper had captured a thirteen-inch carp and had endeavored to swallow

it. Apparently the carp became lodged in the throat of the bass. The bass, being unable to swallow or toss up the carp, had strangled and was cast upon the bank by high water. Such occurrences as this are of particular interest in that they give some knowledge of the

capacity of a bass's throat, and throw light on its voracious habits.

Incidentally, carp are preferred by striped bass, and fishermen claim that when carp can be procured they are the principal food.—P. C. Meakin, Modesto, California.

CONSERVATION IN OTHER STATES

FLORIDA ENACTS ADVANCED LAW

Florida has adopted a system of accurately recording the bags of the hunter and the trapper's take in order to effect a more advanced type of fish and game administration. Good business practice dictates that a record be kept of amounts used of every kind of commodity in order to avoid waste and the folly of over-drawing and thus exhausting the supply.

The following is an extract from an article entitled, "Florida Requires Game Reports" in *Field and Stream*, June, 1928, under the heading of the Bulletin of the American Game Protective Association.

"An improved state-wide game and fish law was passed by the last legislature. One of the provisions of the new law requires hunters and trappers to report what they have taken under their licenses within ten days after the close of the season under penalty of being denied a license for the next season.

"This requirement is found in the laws of very few states, but some others have a voluntary system of reports. It should be mandatory in every state in order that reliable statistics of the kill of game from year to year might be collected. There can be no better index of the tendency toward increase or depletion than is furnished by such reports, and they supply a sound basis on which to base restrictive or other regulations. Minnesota was the first state to enact a law making such reports mandatory."

NEW BRUNSWICK GAINS IMPORTANT ADDITION TO REFUGE SYSTEM

The establishment of the Lapreau Game Refuge in the wilds of New Brunswick adds one of the best areas for big game in the province to the system. The refuge comprises nearly ninety-five square miles and brings the total territory set aside for game refuges to almost five hundred square miles. The new refuge is the result of a determined policy on the part of the present administration to enlarge the sanctuary area of New Brunswick.

RECENT LEGISLATION IN KENTUCKY

Several new laws were enacted by the Kentucky legislature at its last session. These afford additional protection to game and fish and enlarge on the powers of the Kentucky Commission to more adequately administer refuges. Increased funds also will aid in a greater output from hatcheries.

A few of the new enactments are:

Doves may be shot only from noon until six o'clock each day during open season.

Bass and crappie may not be sold.

Deer and pheasants may not be killed until 1932.

NEW YORK PROVIDING FOOD FOR GAME

Food for game animals and birds will be an important consideration in the reforestation program of the New York Development Association. A liberal number of berry-bearing trees and shrubs will be planted to each acre. Hardwood trees, such as beech and maple, will also be set out and care will be taken to afford both a winter and summer food supply.

The Association contemplates planting some billion trees during the next fifteen years on waste lands in the state and its program provides for the planting of one hundred million trees each year thereafter until all the idle lands are productive.

To further encourage the planting of food producing plants in areas not included within the reforestation project, the Association is distributing suitable trees and shrubs without cost to sportsmen's associations and interested individuals.

MISSOURI IMPORTS QUAIL

The state of Missouri just purchased 3000 quail for liberation this past spring. The birds were released in state-owned and auxiliary game refuges. In making a report on this contribution to the game resources of the state, it is pointed out that the \$2.50 hunting and fishing license falls short \$1.52 of paying for a single pair of the imported quail.

IDAHO TO INTRODUCE EGGS OF FRESHWATER SMELT

An interesting experiment is to be carried out by the Bureau of Fisheries, Idaho State Fish Commissioner and Forest Service in shipping the eggs of the freshwater smelt from eastern Maine for planting in Idaho waters.

This little fish, ordinarily growing to about six inches long, is remarkably prolific and runs in large schools in the deep waters of lakes. In early spring they ascend inlets to spawn, the spawn being very minute and sticking to rocks, sticks, etc. The eggs develop rapidly and hatch in from two weeks to a month, the minute young migrating immediately to deep water.

Owing to the rapid development of the eggs, it is difficult to ship them successfully such long distances. The eggs are to be surrounded by a layer of ice and packed in an insulated box to be sent by express. If this method is not successful, a small shipment by air mail will be attempted.

The object in introducing the smelt is to furnish an abundant and suitable forage fish for trout and salmon to eat. They live principally on minute forms of life which ordinarily occur in abundance in deep water lakes and turn this into a readily available trout food. In one instance, a lake in which trout were not thriving, owing to a lack of large forms of food, although the minute forms were abundant, was stocked with the smelt in the spring and that fall yearling steelhead trout and landlocked salmon from 6-9 inches long were planted. By the following summer, 8-9 months later and over winter, the trout and salmon reached two pounds in weight. The next summer steelhead trout were taken weighing 4½ lbs., the food being almost entirely the little smelt.

The smelt is the natural food of the landlocked salmon which has never been successfully established in its absence and although encouraging results have come from the introduction of this salmon in the Redfish Lake section in Idaho, the planting of the smelt will make favorable results much more certain. The abundance of trout food which the smelt will supply should improve conditions for other trout as well and it is quite probable that the little redfish occurring there will grow considerably larger in size than at present.

PATHFINDER BIRD REFUGE REESTABLISHED IN WYOMING

By recent executive order, President Coolidge has reestablished for the protec-

tion of native birds the Pathfinder Bird Refuge, embracing 22,700 acres on the North Platte River in central Wyoming. The area is set aside for the use of the Department of Agriculture as one of the numerous refuges administered by the Bureau of Biological Survey.

All the lands involved have been withdrawn for reclamation purposes in connection with the North Platte Project, Wyoming, and are primarily under the jurisdiction of the Department of the Interior. The area includes mainly a reservoir constructed for the use of the Reclamation Service in the irrigation of lands. The establishment of this refuge furnishes nesting grounds as well as important feeding and resting places for the large numbers of migratory waterfowl, especially ducks, in a region where open water areas providing a haven for birds are scarce.

It is unlawful, within the refuge, to hunt, trap, capture, wilfully disturb, or kill any wild animal, or bird of any kind whatever, or take or destroy the eggs of any wild bird, except under such rules and regulations as may be prescribed by the Secretary of Agriculture.

UPPER MISSISSIPPI REFUGE ENLARGED

A joint resolution recently approved by President Coolidge authorizes the Secretary of Agriculture to accept from James B. Munn, of New York City, on behalf of the United States, a gift of certain lands in Clayton County, Iowa, to become a part of the Upper Mississippi River Wild Life and Fish Refuge. These lands, embracing a total area of 488 acres estimated to be worth thirty or forty thousand dollars, were generously donated to the government by Mr. Munn through his interest in the objects of the refuge.

Situated near McGregor, Iowa, the lands are more or less overgrown with original timber and are especially attractive for upland migratory birds. One parcel includes an excellent lookout point, known as Pikes Peak, that will be of great value in connection with fire protection, administrative uses, and other purposes on the refuge. Although adjacent to the lowlands embraced in the refuge much of the area is not subject to overflow, as it extends up into the hills bordering the river bottoms, and the inclusion of this high land will have the desirable result of lending variety to the refuge and attracting and protecting additional species of wild life.

The Upper Mississippi River Wild Life and Fish Refuge includes lands along

both sides of the river between Rock Island, Ill., and Wabasha, Minn., and the acquisition of further lands to be included is being carried forward as rapidly as possible by the Bureau of Biological Survey of the Department of Agriculture.

NEW ANTELOPE PRESERVE FOR NEVADA

The National Association of Audubon Societies has acquired the Last Chance Ranch in northern Nevada, which it will maintain as an antelope sanctuary.

Some time ago at a national conference called in Washington to consider means of saving these beautiful and hard-pressed animals in the semi-desert regions of the west, the National Association of Audubon Societies was appointed to take the lead in securing by congressional action the establishment of an antelope and sage hen reservation in southeastern Oregon. Political interference at the behest of the nomadic sheep herding interests caused the project to fail. Since that time the State of Oregon has declared the killing of antelope in this region to be illegal, but as no wardens are available to enforce the regulation, conditions so far as the antelope are concerned remain virtually unchanged. Reports are current that wandering sheep herders and other travelers of the deserts continue to wipe out the small bands of antelope that still remain. Across the line in Nevada an exactly analogous situation exists, but it is here that a real reservation has at last been created.

While Dr. T. Gilbert Pearson, president of the Audubon Association was engaged in field work in the west last summer he learned from E. R. Sans of Reno of the peculiar conditions that surround this Last Chance Ranch in northern Nevada.

This range of 380 acres contains open water, and water in this desert means many things, one of which is that from great distances antelopes come in spring to drop their fawns on the slopes surrounding the water hole. It is this ranch

the Association has acquired.—*Outdoor Life-Recreation*, Vol. 61, No. 4.

NORTH CAROLINA UNDERTAKES A GAME BAG CENSUS

The Director of the Department of Conservation and Development of North Carolina sent out 125,000 return card blanks during the month of March. Hunters are asked to fill in the blanks with the number of each species of game taken and to return the card. The census will provide the state with the first definite and comprehensive idea of the value and extent of game animals and birds taken during any one open season. With this as a basis, some estimate can be made of the game population of the state.

GEORGIA CREATES REFUGES

A decreasing game supply has forced Georgia to begin the establishment of a series of game refuges and public shooting grounds in various parts of the state. One such forest and game preserve has been created and others are to follow in the central and southern part of the state, and on the coast.

Mexican quail are also being introduced. In 1926, 6000 quail were imported, and in 1927, 5000.

HUNGARIAN PARTRIDGES IN PENNSYLVANIA

During the past three years, the Game Commission of Pennsylvania has undertaken the acclimatization of the Hungarian partridge. In 1925, 3962 Hungarian partridges were imported from Czecho-Slovakia. They arrived in good condition and were immediately released. In 1926, 1643 were similarly imported and released. It may be that the releasing of these birds in sizable coveys rather than in small lots has contributed to the success obtained. In nearly all of the places where these partridges were released, there has been evidence of normal increase. In only one instance did the birds entirely disappear. In one county where 216 were released, it is estimated that there are now 1200 birds.

REPORTS

GAME CASES

January, February, March, 1923

Violation	Number arrests	Fines imposed	Jail sentences (days)
Hunting license Act.....	17	\$460	-----
Deer Tag License Act.....	1	50	-----
Deer: buy or sell; run with dogs; taking and possession, closed season; failure to retain horns and hide; over bag limit.....	22	3,375	-----
Deer: taking and possession, does, fawns, spiked bucks, forked horns in Dist. 14.....	13	1,310	-----
Rabbits: cottontail, brush; taking and possession, closed season.....	28	685	30
Ducks: buy or sell; taking and possession; closed season; over bag limit.....	21	686	90
Geese: taking and possession, closed season; over bag limit.....	6	175	30
Mudhens: taking and possession, closed season.....	7	175	60
Swans: taking and possession (no open season).....	1	25	-----
Shorebirds: taking and possession (no open season).....	6	150	-----
Quail: taking and possession, closed season; over bag limit.....	13	450	83
Pheasants: taking and possession (no open season).....	4	500	-----
Non-game birds: taking and possession.....	6	140	-----
Commercial Gun Club License Act.....	1	200	-----
Fur Trapping Regulations.....	3	85	-----
Shooting wild game from power boat.....	2	10	-----
Game refugees: hunting and possession of firearms.....	2	50	-----
Night hunting.....	11	310	-----
Bird nets: illegal possession of.....	2	50	-----
Totals.....	166	\$8,885	293

FISH CASES

January, February, March, 1923

Violation	Number arrests	Fines imposed	Jail sentences (days)
Angling License Act.....	38	\$1,010	360
Commercial Fishing License Act.....	19	210	-----
Trout: taking and possession, closed season.....	19	370	60
Black bass: taking and possession, closed season.....	7	225	60
Sunfish, perch, crappie: taking and possession, closed season.....	12	310	30
Night fishing, illegal.....	2	25	-----
Striped bass: undersized and overlimit.....	7	450	-----
Salmon: illegal taking and possession.....	1	100	-----
Catfish: sale of undersized.....	6	210	-----
Barracuda: undersized.....	1	50	-----
Spot-fin croaker: sale of.....	1	50	-----
Crabs, undersized.....	13	275	30
Clams: undersized and overlimit.....	57	1,349	130
Abalones: taking and possession, closed season; removal of shells from below high tide mark; undersized and overlimit.....	53	1,390	-----
Lobsters: taking and possession, closed season; undersized.....	9	265	-----
Illegal fishing: fish reservation.....	2	75	-----
Nets, traps, lines, spears: illegal possession or use.....	18	1,430	-----
Water pollution.....	5	1,300	-----
Totals.....	270	\$9,094	670

SEIZURES OF FISH AND GAME

January, February, March, 1928

Deer meat, pounds.....	449
Rabbits, cottontail, brush.....	27
Ducks.....	494
Geese.....	29
Mudhens.....	5
Swans.....	1
Shorebirds.....	5
Divers.....	1
Quail.....	16
Pheasants.....	4
Non-game birds.....	27
Trout.....	77
Black bass.....	11
Sunfish, perch, crappie.....	85
Striped bass, pounds.....	47
Catfish, pounds.....	712
Barracuda, pounds.....	4,755
Calico bass.....	1
Crabs.....	52
Clams.....	1,365
Abalones.....	527
Abalone meat, pounds.....	39
Lobsters, pounds.....	178
Nets, fish spears.....	4
Bird nets.....	1

STATEMENT OF INCOME

For the Period January 1, 1928, to March 31, 1928, of the Seventy-ninth Fiscal Year

License sales:	Detail	Total
Angling licenses, 1927.....	\$23,531 00	
Angling licenses, 1928.....	4,601 00	
Hunting licenses, 1927-1928.....	110,649 00	
Hunting licenses, 1928.....	334 00	
Market fishermen's licenses, 1927-1928.....	3,630 00	
Market fishermen's licenses, 1928-1929.....	230 00	
Wholesale fish packers' and shell fish dealers' licenses, 1927-1928.....	45 00	
Game breeders' licenses, 1928.....	460 00	
Fish breeders' licenses, 1928.....	175 00	
Trapping licenses, 1927-1928.....	1,244 00	
Deer tag licenses, 1927.....	14,125 00	
Total license sales.....		\$159,024 00
Other income:		
Game tag sales.....	\$7 92	
Fish tag sales.....	1,621 93	
Court fines.....	15,237 35	
Fish packers' tax.....	23,311 54	
Kelp tax.....	3 75	
Miscellaneous sales.....	125 00	
Interest on bank deposits.....	405 07	
Total other income.....		40,712 56
Total income.....		\$199,736 56

STATEMENT OF EXPENDITURES

For the Period January 1, 1928, to March 31, 1928, of the Seventy-ninth Fiscal Year

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Administration:					
Executive and legal.....		\$4,181 94	\$265 58	\$1,022 89	\$5,470 41
Clerical and office.....	\$213 15	4,399 77	612 43	78 88	5,304 23
Rent.....			2,582 58		2,582 58
Automobiles.....	114 30		120 45		234 75
Telephone and telegraph.....			987 60		987 60
Postage.....			1,023 40		1,023 40
Freight, cartage and express.....			294 16		294 16
Printing.....	3,161 54				3,161 54
Accident and death claims.....			166 35		166 35
Commissioners.....			528 39		528 39
Total administration.....	\$3,488 99	\$8,581 71	\$6,580 94	\$1,101 77	\$19,753 41
Education:					
Director and assistants.....	\$222 07	\$3,175 00	\$563 03	\$1,201 09	\$5,161 19
Publicity:					
Director.....		\$825 00	\$220 47		\$1,045 47
Conservation and protection:					
Chief and assistants.....		\$3,129 99	\$591 56	\$4 25	\$3,725 80
Clerical and office.....	\$50 91	695 00			745 91
Rent.....			98 46		98 46
Automobiles.....	392 90		88 21		481 11
Captains and deputies.....	71 85	51,370 02	39,281 53	27 10	90,750 50
Patrol launches.....	278 93	525 00	212 69	2,923 32	3,939 94
Lion hunting.....		750 00	270 57		1,020 57
Lion bounties.....			2,990 00		2,990 00
Fish planting.....		630 00	87 75		717 75
Refuge posting.....	706 54	605 00	518 98		1,830 52
Total conservation and protection.....	\$1,501 13	\$57,705 01	\$44,139 75	\$2,954 67	\$106,300 56
Commercial fisheries:					
Chief and assistants.....	\$75 25	\$2,743 33	\$609 39		\$3,427 97
Deputies.....	97 48	8,976 21	2,733 06		11,806 75
Patrol launches.....	553 72	1,220 00	94 17	48 65	1,916 54
Statistical.....	244 23	1,415 00	46 67		1,705 90
Laboratory.....	420 59	7,533 39	1,185 35	380 70	9,520 03
Botulism.....			3,750 00		3,750 00
Automobiles.....	126 64		79 56		206 20
Total commercial fisheries.....	\$1,517 91	\$21,887 93	\$8,498 20	\$429 35	\$32,333 39
Fish culture:					
Chief and assistants.....		\$1,033 33	\$25 50	\$10 20	\$1,069 03
Clerical and office.....	\$57 82	905 00	12 80		975 62
Rent.....			255 00		255 00
Automobiles.....	810 12		168 70	4 20	983 02
Hatcheries.....	7,052 21	26,245 88	3,198 04	3,040 94	39,537 07
Hatcheries, additions and betterments.....				17,362 09	17,362 09
Special field investigation.....		2,509 06	527 43		3,036 49
Total fish culture.....	\$7,920 15	\$30,693 27	\$4,187 47	\$20,417 43	\$63,218 32
Hydraulics:					
Chief and assistants.....	\$6 30	\$1,375 00	\$511 31	\$45 29	\$1,937 90
Cooperative research work.....	13 21	750 00	20 60		783 81
Total hydraulics.....	\$19 51	\$2,125 00	\$531 91	\$45 29	\$2,721 71
Game propagation:					
Game farm, Yountville.....	\$1,112 28	\$1,958 00	\$352 63	\$962 46	\$4,385 37
Automobiles.....	165 29				165 29
Total game propagation.....	\$1,277 57	\$1,958 00	\$352 63	\$962 46	\$4,550 66
Research:					
Chief and assistants.....	\$27 91	\$2,217 26	\$260 89		\$2,506 06
License commissions.....			\$10,325 55		\$10,325 55
Total Division of Fish and Game.....	\$15,975 24	\$129,168 18	\$75,660 84	\$27,112 06	\$247,916 32

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JANUARY, FEBRUARY AND MARCH, 1928

Compiled by Division of Fish and Game, Department of Commercial Fisheries

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake...	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey
Albacore									
Anchovies									7
Barbauda									110
Bonito									
Carp		54,583		4,191	22,317	10,259	116		
Catfish		6,760		1,765	34,349	28,780			
Cultus Cod							151,686	2,065	21,985
Eels							5		
Flounders	11,281	10,790		25			77,450	1,681	170
Grayfish							104,025	125	650
Halibut	63,853						3,159	412	3,624
Hardhead									
Herring	61,442		350,650		22,247	20,355	502,620	3,089	21,581
Kingfish							625	18	382,435
Mackerel									400
Mackerel—Horse									
Mullet									
Perch	14,138	3,161	30,180				1,289	625	1,586
Pike				37	1,553	645			
Pompano									
Rock Bass									
Rockfish	21,133	10,100					255,204	52,044	529,350
Sablefish	88,424						148,275	4,124	724
Salmon				1,929	7,669	4,799	31	378	7,542
Sandbars		13,030					5,341,094	200	80,498,675
Sardines									10
Sculpin									
Sea Bass—Black								57	
Sea Bass—White							130		
Shad				54	56	513			
Shad—Buck				8,411	4,090	26,583			
Shad—Roe				6,700	3,498	22,626			
Sheepshead									
Skates		1,040					77,929	1,560	13,115
Skipjack									
Smelt	25,613	91	4,262				21,969	4,954	1,423
Sole		98,790					2,603,381	10,699	33,431

Spittail.....					7,223	67			
Striped Bass.....					27,921	76,495			
Suckers.....					969	11		2,901	
Swordfish.....									
Tuna—Bluefin.....									
Tuna—Yellowfin.....									
Turbot.....									
Whitebait.....				135					
Whitefish.....				163				215	15
Yellowtail.....									
Miscellaneous.....					50	4		13,480	976
Total fish.....	205,273	199,375	395,390		131,942	191,107		9,528,775	82,486
Crustaceans:									
Crabs.....									
Shrimps.....								4935,640	710,944
Spiny Lobsters.....	146,704	21,128	282,744					85,231	
Mollusks:									
Abalones.....									131,900
Clams—Cockle.....									
Clams—Mixed.....				75					977
Clams—Pismo.....	2,889		12,798						428
Clams—Scotchell.....									
Cuttlefish.....			28,006	285		11,312		1,808	
Mussels.....								463	175
Oysters—Eastern.....								160	910
Squid.....								468,475	
Totals.....	344,866	200,863	819,610		131,942	202,419		10,820,552	455,297
									81,751,240

All amounts shown in pounds unless otherwise specified. Albacore and skipjack cleaned.

11,946 dozen.

247 dozen.

454,786 shell oysters.

438,985 dozen.

311,250 shell oysters.

15,532 dozen.

7456 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JANUARY, FEBRUARY AND MARCH, 1923

Compiled by Division of Fish and Game, Department of Commercial Fisheries

Species of fish	San Luis Obispo, Santa Barbara, Ventura.....	Los Angeles.....	Orange.....	San Diego, Imperial.....	Total.....	Fish from south of the International Boundary line brought into California via San Pedro.....	Fish from south of the International Boundary line brought into California via San Diego.....	Total fish from south of the Inter- national Bound- ary line brought into California...
Albacore.....		348			348			
Anchovies.....		1,345			1,345			
Barracuda.....		46,501	114	15,955	62,577		90,973	619,458
Bonito.....	8	14,613	43	20,244	35,018		15,326	38,008
Carp.....					36,883			
Catfish.....					119,477			
Cultus Cod.....	50	400	20		183,224			
Eels.....					5			
Flounders.....		20			101,417			
Grayfish.....		17,229	117	3,208	125,354			
Halibut.....	68,024	200,302	32,450	81,388	453,212		78,867	78,922
Hardhead.....					22,247			
Herring.....	490	131,640	172	6,938	952,465			
Kingfish.....		1,386,764	225,851	323,303	2,305,106			
Mackerel.....	4,735	85,772	170	220	86,342	200		200
Mullet.....	393			2,558	64,700	6,459	28,900	35,389
Pike.....		13,197		231	2,235	312	878	1,190
Pompano.....		52			52			
Rock Bass.....	3,583	30,193	24,488	8,052	66,316	1,286	14,498	15,784
Rockfish.....	43,362	530,026	32,440	443,004	1,916,663		14,273	14,273
Sablefish.....	90	4,268			245,900			
Salmon.....					14,428			
Sandabs.....		4,459			248,610			
Sardines.....		88,116,999		5,680,879	179,637,847			
Sculpin.....	25	4,594	332	11,381	16,282			
Sea Bass—Black.....		2,546	6,550	61,387	70,483	2,151	24,260	26,411
Sea Bass—White.....	731	7,136	3,240	10,849	22,013	12,748	33,277	46,025
Shad.....					733			
Shad—Puck.....					39,084			
Shad—Roe.....					32,824			
Sheepshead.....	18	142,052	1,528	11,293	154,891			
Skates.....		10,137	236	1,400	105,357			
Stripjack.....						270,369	433,839	704,208
Snelt.....	21,584	132,664	438	13,387	226,375	75		75
Sole.....	30,204	8,826	1,688	6,885	2,843,904			

Spittail.....						7,290			
Striped Bass.....						113,070			
Suckers.....						980			
Swordfish.....					300				
Tuna—Bluefin.....						532,898			
Tuna—Yellowfin.....			23			1,620	893,801	3,719,643	4,613,444
Turbot.....						1,135			
Whitebait.....						9,888			
Whitfish.....						59,241	3,243	17,635	20,878
Yellowtail.....			87			28,744	223,533	100,441	323,974
Miscellaneous.....			354			35,542	4,545	1,637	6,182
Total fish.....	173,419	91,506,219	330,418		6,729,822	191,140,900	1,969,944	4,574,447	6,544,391
Crustaceans:									
Crabs.....									
Shrimps.....						\$1,367,184			
Spiny Lobsters.....	22,313	45,110	2,204		70,762	140,389		494,792	494,792
Mollusks:									
Abalone.....	1,581					123,481			
Clams—Cockle.....						16,696			
Clams—Mixed.....						16,905			
Clams—Pismo.....					241	22,558			
Clams—Softshell.....	22,130					41,411			
Cuttlefish.....						1,704			
Mussels.....			4			1,070			
Oysters—Eastern.....						\$168,526			
Squid.....						68,097			
Totals.....	219,443	91,551,589	332,626		6,800,584	193,459,896	1,969,944	5,069,239	7,039,183

\$56.966 dozen.

\$766.036 shell oysters.

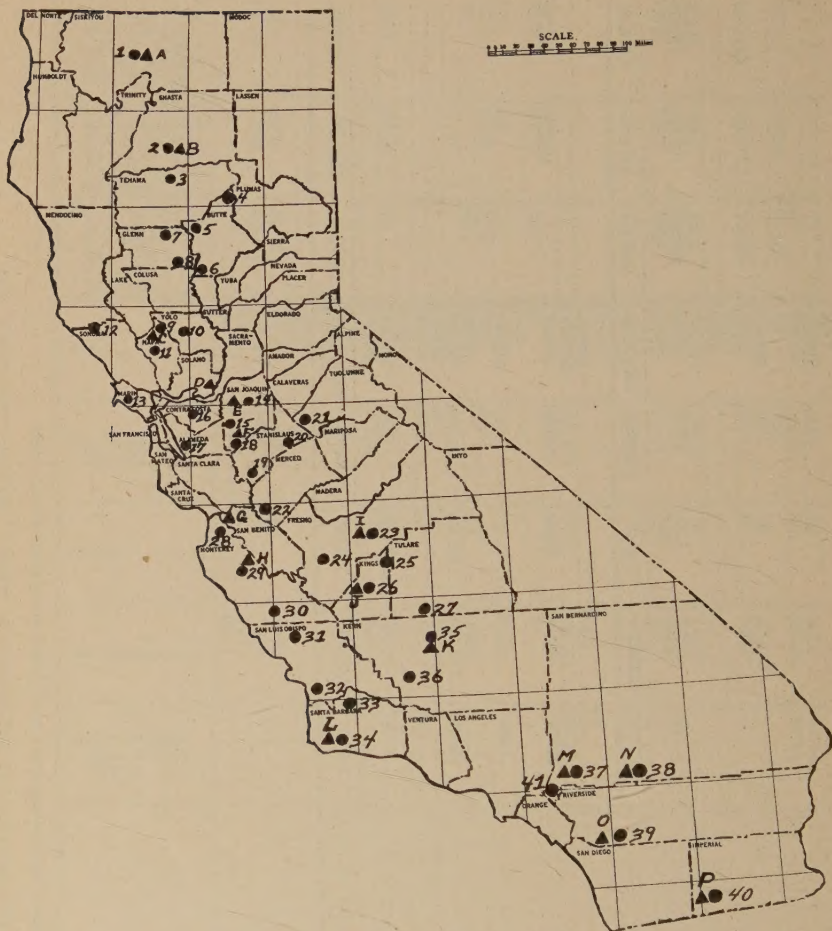


FIG. 76. Map showing pheasant plantings in California for 1926 and 1927.
Map by courtesy of Rand McNally.

1926 Plantings—▲—Letters			1927 Plantings—●—Numbers			1927 Plantings—●—Numbers		
Plant	No. of birds	Nearest Locality	Plant	No. of birds	Nearest Locality	Plant	No. of birds	Nearest Locality
A	169	Dunsmuir	1	126	Dunsmuir	22	150	Merced
B	229	Redding	2	462	Redding	23	557	Sanger
C	174	Napa	3	100	Red Bluff	24	130	Coalinga
D	42	Birds Ldg.	4	240	Chico	25	190	Hanford
E	208	Stockton	5	150	Marysville	26	140	Hanford
F	278	Modesto	6	150	Roseville	27	150	Tulare
G	189	Salinas	7	125	Orland	28	225	Salinas
H	192	Soledad	8	140	Willows	29	126	Gonzales
I	300	Fresno	9	427	Napa Valley	30	318	Soledad
J	175	Hanford	10	240	Woodland	31	80	Atascadero
K	250	Bakersfield	11	393	Birds Ldg.	32	120	Buellton
L	252	Solvang	12	110	Healdsburg	33	120	Santa Maria
M	252	Chino	13	184	Point Reyes	34	80	Santa Barbara
N	495	Colton	14	126	Lodi	35	150	Bakersfield
O	105	Temecula	15	150	Crows Ldg.	36	140	Bakersfield
P	110	El Centro	16	100	Pleasanton	37	366	Chino
			17	80	Centerville	38	246	Colton
			18	221	Modesto	39	120	Temecula
			19	150	Stockton	40	240	El Centro
			20	72	Oakdale	41	240	Ontario
			21	72	Sonora			